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THE ARROW-HART & HEGEMAN ELECTRIC CO. HARTFORD, CONN.



VOLUME 33
NUMBER 5

electrical contracting

WITH WHICH IS CONSOLIDATED ELECTRICAL RECORD

S. B. WILLIAMS, EDITOR AND GENERAL MANAGER

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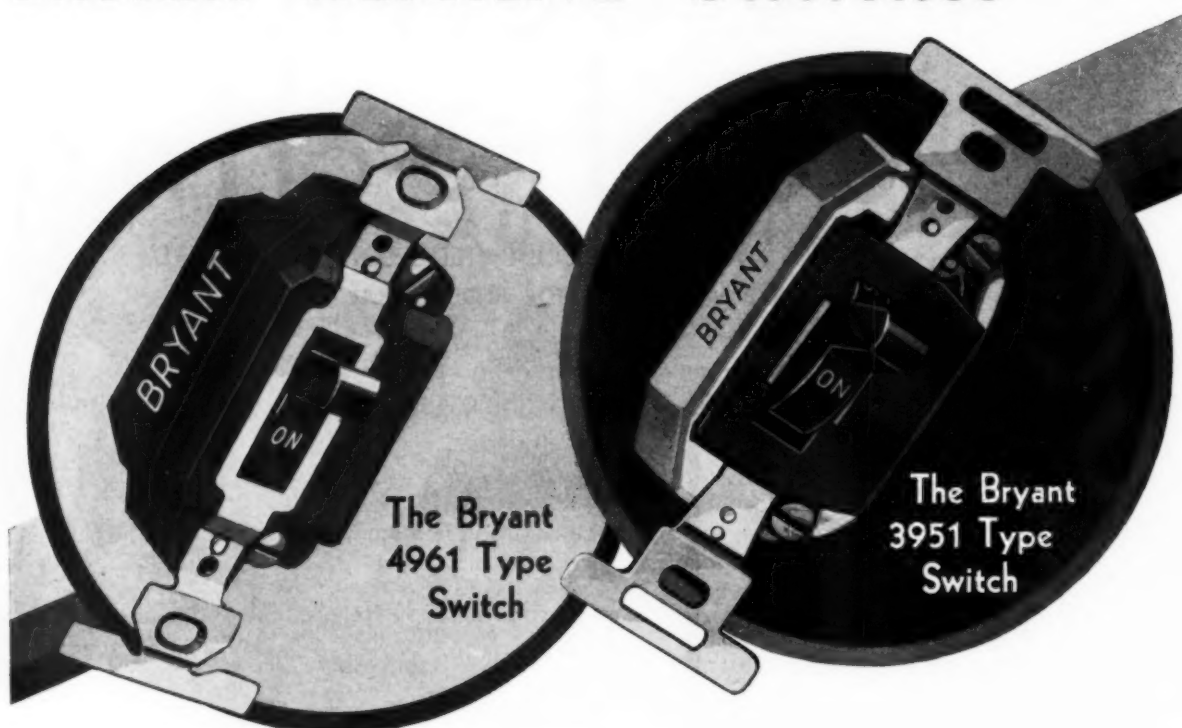
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A Planning Board

THE electrical industry is like a man starving in the midst of plenty. About us are opportunities too numerous to mention but we do not know how to take advantage of them.

As business generally improves the volume of electrical business will naturally increase but until we learn how to take advantage of our opportunities we shall never know the meaning of real financial success.

In fact there is the possibility that the depression may have been too short lived to have been of maximum benefit to the electrical industry. Unless the depression has taught a lesson that can be capitalized in the future it shall have been in vain.

AN industry planning board taking the above axiom might create a new national conception of possibilities for the industry. It might prevent unsound plans from gaining a foothold. It might create a new sense of responsibility on the part of individual branches of the industry which will urge them forward to greater sales achievements.

Right now, for instance, there are opportunities in reinspection but the industry not only does not know how to take advantage of the situation, nor is it making any concerted effort to find out.

There are opportunities for relighting and some progress is being made, but the entire industry has not been marshalled into a sales army.

This spring will bring new opportunities for outdoor lighting. Some national planning would make it possible for the industry to get the most out of the market.

The construction of new homes is reviving and bids fair to increase considerably. Are we to permit these homes to be wired in a minimum manner or will they have wiring adequate for the future?

Then there are unsound practices which creep in during a period of low demand such as the rental purchase plan for refrigerators and ranges. It might help some manufacturer to move some merchandise and it might produce some energy load but is that

worthwhile when compared to the damage it will do to the retailing trade, and to the other manufacturers? A planning board would quickly study such propositions and show the relative advantages and disadvantages from an industry standpoint.

There is a large amount of competition within the very ranks of the industry which creates no business but engenders distrust and causes possible profits to fade into losses. When this competition occurs between suppliers and customers it is obvious that a change must be made. This is a job for a planning board to study and find a solution.

There is a lurking distrust throughout the industry of the selling-ability of each other member of the industry. Without question there is a reason for this feeling but the solution is not recrimination. Rather does the answer lie in a study of the reasons for this condition. Do the margins permit of aggressive selling? Have all of the elements that enjoy any of the benefits of the sale made their proportional contribution to the development of the market? Does the industry know what the market is and how the market can be sold? Solve this problem of sales and distribution and the industry will make strides the like of which has never before been experienced by the industry.

THE publishers of ELECTRICAL CONTRACTING has no plan to offer for a planning board other than that it should be national and should have access to the thinking and confidence of the industry. The need for such a board is apparent on every hand.

There is no necessity for the expenditure of a large sum of money, although it is very probable that the findings of the board frequently may cause certain projects to be started which will need money.

Today the electrical industry is organized as separate parts but disorganized as a whole. We must work together as an industry if we are to achieve individually our greatest measure of success.

Jobs are there for alert electrical contractors



PUBLIC BUILDINGS



HOUSING PROJECTS



SCHOOLS



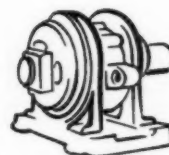
HOSPITALS

THE construction industry is coming back to life. For the first time in years, sizeable funds are being made available for construction projects large and small, public and private. These projects mean more and more jobs for electrical contractors if they go out after these jobs.

The contractor's opportunities will be varied in scope. It may be a simple remodelling job. Or it may be a large scale public building project.

Naturally, electrical equipment will be needed. Quickly and economically. The contractor must have a dependable source of supply, geared to his needs.

Graybar fulfills this need. It brings to electrical contractors an experienced service of supply equal to any requirement and including anything and everything electrical. It brings, too, a 65 year old reputation for dependable materials—a reputation that will back up the reliable contractor's own good reputation.



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NUMBER 5

electrical contracting

WITH WHICH IS CONSOLIDATED ELECTRICAL RECORD

MARCH
1934

Single line feed

by
**JOHN
WISE**



Dog-tired and grimy from a long day's practice march, a doughboy regiment pulled into a big open field just after dusk and settled down to roost for the night. While camp was being made, the stable details unhooked and led out all the four-footed "rolling-stock" and picketed them in two lines, horses in one string and mules in the other, about 50 ft. apart. Then the animals had to be fed, and soon that old sweet essence of baled hay mingled with the odors of boiling coffee and simmering stew.

Then the fun began. Wild squeals from the picket-lines were accompanied by a bass-drum chorus of hoofs on ribs. The stable gang came on the hotfoot, as injured animals are not only useless but a disgrace to their handlers. The ground was a bit soft and the picket-pins came up easier than usual, so the mules were visiting the horses and vice-versa, and they tangled when they met. "Can you tie that?" yelled an exasperated Sergeant, "We had to boot 'em along every step of the last two miles to camp, but they ain't too tired to scrap!" All the weary hostlers could do was to drag the strays back to their places and try to drive the pins deeper.

No use, the breakaways continued to squeal and heel-plaster each other merrily, till the whole camp was aroused. And a sarcastic message from the Adjutant didn't make the harness and saddle boys feel any better. He stated, with feeling and expression, that if the racket

wasn't stopped pronto, there would be a flock of plow-jockeys walking with packs the next day, instead of riding the cushions.

So they sent for old "Custer" Dugan, a cavalry veteran, who knew as much about horses as any man in Uncle Sam's Army. Dugan took one look at the mess,

flopped on a bale of hay, and laughed himself weak. "I got it!" sezze, "These doggoned hunks of glue in each line think the other bunch is getting more and better hay. Put 'em all in one long line, with the grub in front of 'em, and they'll stay put like kittens full of milk." No sooner said than done, and in 20 minutes it was so quiet you could hear the Colonel's nightly pint gurgling down the hatch.

Think it over, contractors and wholesalers. The market abuses, broken agreements and left-handed ethics of the past were the result of unnecessary aloofness and mutual distrust. Now the silver lining is unfolding all over the country, as these two branches are getting together as never before. State after state reports them sitting down in joint session, planning increased co-operation and actually carrying out the plans.

When properly organized, contractors anywhere can reach mutually satisfactory agreements with their suppliers. This can only be done, however, by lining up side by side, and tying the can on all rough stuff.

Latest Modifications in Electrical Contractors Code

SET up as a separate chapter of the Code of Fair Competition for the construction industry, the code for the electrical contracting division is rapidly approaching its final form in which it shall be submitted to the President for approval. The electrical contractors' code, which in a large measure has broken the way for the codes for other divisions of the construction industry, has received a barrage of opposition.

This opposition has centered largely in (1) the provision of minimum wages for skilled labor, and (2) definition of the industry. Opposition in the latter case has come from manufacturers generally on account of maintenance work, from the electrical manufacturers because of the definition of the electrical manufacturing industry contained in their own code and from service shops objecting to being included in the construction industry.

The most recent modification of the electrical contractors' code recognizes the objections of the electrical manufacturers and the service shops by excepting the manufacturing, assembling, servicing or repairing of electrical apparatus, appliances or equipment by a manufacturer or a service shop, but specifically directs that disconnecting, connecting or installing of wiring on the customer's premises shall come under the provisions of this chapter.

Maintenance Work

The greatest modification in the code comes in a recognition of the work of the industrial maintenance man as apart from construction. To accomplish this an exception is made to the maintaining, servicing or repairing of existing installations or the moving and relocating of equipment within a plant or property when performed by an owner or tenant (not for hire), individually or with his permanent employees for electrical maintenance work within his own property. The installation of all new work shall be under the provisions of the code. Permanent em-

ployees are defined as those regularly and continuously employed by an owner or tenant within such owner's or tenant's plant or property for a period of not less than six months.

Other exceptions cover telephone or telegraph work as a part of a system owned and operated by a telephone or telegraph company except that when conduits or other raceways are installed for telephone or telegraph facilities, the installation of all wires and cables contained therein shall be done under this code. The sale or rental of fire and burglar alarm systems and the maintenance thereof where such work is an integral part of the system owned and serviced or maintained by a member of the Electrical Protection Service Industry is excepted. The exception to work done by power companies on their own systems or emergency work on customer's premises necessary to render safe and continuous service is the same as previously reported.

Provision for Overhead

In the latest draft of the code the 15 percent minimum allowance for overhead has been withdrawn, but overhead is still defined as an item of cost, except that depreciation on unused facilities, interest on indebtedness and investment, and selling expense are excluded. The code also provides that the Divisional Code Authority shall make available an accounting system and method of cost finding, as well as a method of estimating, capable of use by all members of the industry, and when made available the principles thereof shall be the basis for determining costs and estimates.

The code also provides that when the Divisional Code Authority shall determine that an emergency exists in the industry due to destructive price-cutting such as to render ineffective and seriously endanger the maintenance of the provisions of the code, the Divisional Code Authority may, in a manner described in the code, determine a reasonable cost for

the products of the industry below which no member of the industry may go during the period of the emergency.

Very definite instructions are given for the selection of the Divisional Code Authority which shall include seven members selected by the Executive Committee of the National Electrical Contractors Association from its association membership. The Executive Committee also is to select three non-members who must be approved by the Administrator. At its meeting in Washington on March 3, 4 and 5, the Executive Committee, N.E.C.A., selected seven members to be appointed to the Divisional Code Authority when the code shall have been approved by the President. The members so selected are:

L. E. Mayer, Chicago, President, N.E.C.A.

E. N. Peak, Marshalltown, Iowa, Vice-President, N. E. C. A.

W. W. Ingalls, Miami, Fla.

A. J. Hixon, Boston, Mass.

J. G. Livingston, New York City.

D. B. Clayton, Birmingham, Ala.

Lloyd Flatland, San Francisco, Calif.

Blue Eagle Regulation

Another interesting paragraph in the code as it now stands gives the Divisional Code Authority the power to cooperate with the Administrator in regulating the use of the Blue Eagle solely to those members of the industry who have assented to and are complying with the code. In this connection it is interesting to note that "compliance with the Code" is taken to mean assumption of one's share of the cost of administering the Code. The Administration has made it clear that all members of an industry must register with a local authority or in the absence of a local with the Divisional Authority.

Since one of the ways of registering is through membership in the national association the Administrator has insisted that the constitution

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and by-laws of sponsor associations be non-restrictive in membership provisions. In this connection the Administrator has asked that certain changes be made in the N.E.C.A. by-laws. These have been assented to by the executive committee and will be submitted to a meeting of the Association.

The Executive Committee also named its appointments to the boards under the General Construction Code as follows:

Construction Code Authority, General Manager, L. W. Davis.

National Construction Planning and Adjustment Board, A. J. Hixon, Boston, Mass.

On the Construction Appeals Board each sponsor may nominate one name to be submitted to the Code Authority for election, but only four sub-contractors will be elected. The nomination which was made by the N.E.C.A. was Frank W. Cooper of the J. Livingston Co., New York City.

Construction Industry General Code

THE general code of fair competition for the entire construction industry was approved by President Roosevelt on January 31 and became effective on March 2. The electrical construction industry has abandoned the idea of an independent code and has offered its code as supplemental to the general code. The National Electrical Contractors' Association, therefore, becomes a sponsor of the general code.

Under the present set up the general code becomes Chapter I of the Code of Fair Competition of the Construction Industry. The different divisions of the construction industry will each have a code which will be a separate chapter of the entire code of the industry. The general code, or Chapter I, contains all of the general provisions, fundamental labor provisions and the rules governing competitive bidding. These are not repeated in the divisional chapters and therefore Chapter I must be taken with the Chapter for any particular division in order to have the complete code for that division of the industry. Wherever there is any conflict between the provisions of the general code and the divisional chapter the latter shall govern.

The general code provides for area agreements based upon collective bargaining between employers and labor with a board of two from labor, two from the employers and one disinterested chairman to hear complaints.

These area agreements, however, will not abrogate the provisions of a previously made labor contract.

While the code specifies that area agreements shall be made between truly representative groups of employers and employees there is nothing

in the code that defines "truly representative" or which defines what constitutes an area for this purpose.

No conditions are set up for skilled labor, but where area agreements are not arrived at maximum hours for labor generally are set at 40 hours a week and minimum rates of pay at 40 cents an hour. Office and clerical employees' minimum salaries range from \$12.00 to \$15.00 a week, depending on population. Exceptions to the hours are made in unusual and emergency cases which are enumerated.

The general code, in addition to area agreement boards, calls for a code authority with one or more members from each sponsoring body which will function as an administrative body to make investigations and surveys of the operation of the code and gather data and statistics relative to the construction industry. There is also a planning and adjustment board for the purpose of settling trade jurisdictional disputes, the promotion of better relations between employer and labor and the making of decisions on all such differences as may arise relating to wages, hours of employment and working conditions. Finally, there is a construction board of appeals which shall determine, in the event of a conflict between provisions of various chapters of the code applicable to specific divisions which of such chapter provisions shall govern.

The competitive bidding practices are set forth very clearly and fully. They prohibit bid peddling or bid shopping.

Awarding authorities shall not invite an unnecessary number of bids while only a limited number of alter-

nate proposals shall be required.

All bidders shall receive uniformly the same specifications and other requisite information.

Bids shall be invited only from bidders who have demonstrated to the satisfaction of the awarding authority technical and financial competency to perform the work.

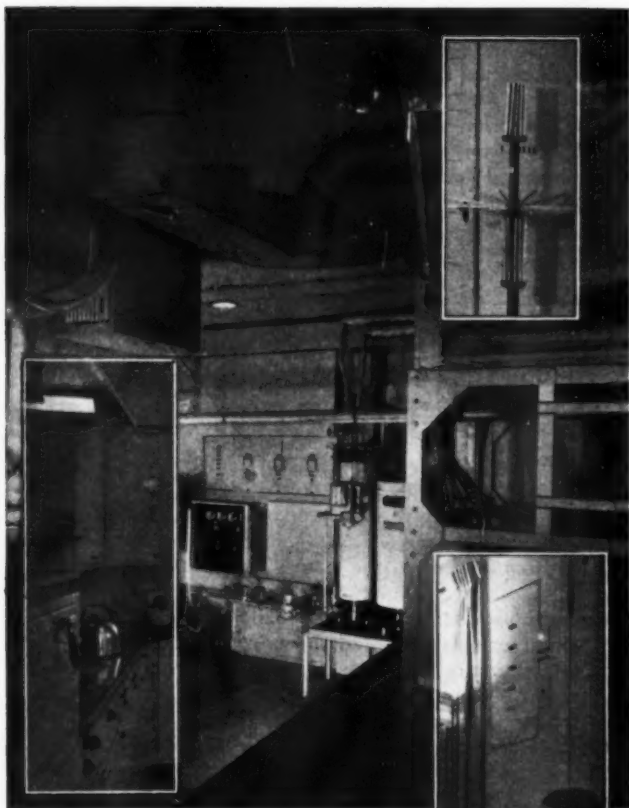
Awards are to be made at the bidder's original bid price.

All bids by subcontractors to general contractors shall be made at least twenty-four hours prior to the time set for general contractor's bid. Bids received after that time or from uninvited bids shall be returned unopened.

The awarding authority shall not disclose to any bidder any information regarding the price or terms of any other bidder prior to award of contract.

There shall be no collusion between awarding authority and any bidder, or between bidders in their preparation of a bid. The awarding authority shall not use any bid so low as to indicate an error or mistake in estimating without first giving the bidder the opportunity of demonstrating by cost sheets or other methods the correctness of the bid submitted.

Contracts must be awarded or rejected within twenty days. Where all bids are rejected no bids may be invited for substantially the same work prior to the lapse of ninety days. The awarding authority may require any bidder to name the subcontractors whom such bidder intends to employ. The awarding authority shall not accept rebates, refunds, discounts or other special allowances from bidders unless included in the original bid.



Circuit control is by circuit breakers with main service and sub-panel load centers. The main breakers will be seen at the back of the heater room with one branch panel at the left. The major portion of the basement is controlled from a branch panel in the laundry (insert upper right). The kitchen circuits have a branch panel in the kitchen (lower left). In the lower right insert is the panel controlling the wall heating in the pent house. Wires giving low heat intensity are embedded in the walls raising the temperature thereof just enough above body temperature to prevent radiation of heat from the body thereby making it possible to live comfortably in a room of lower than customary temperature.

The box with louvre near the pipes in ceiling of heater room contains the reverse refrigeration cycle apparatus which uses the heat taken from this room when cooled to heat a hot water tank.



An 87 Kw.

Westinghouse opens a completely electrified experimental home at Mansfield, Ohio, which required over three miles of wire and has an estimated energy consumption of 18,000 kw-hr. per year.



An automatic iron circuit and tell-tale light. The cord is automatically adjusted to the ironing operation by means of a balance arm.



The garage doors may be opened by a key in this switch or by special radio in the car.

The two master bedrooms have a wall switch for lighting small panel lights in all rooms and lights outdoors to serve as a burglar alarm. An independent control on the table will light the small lights in the passage to the bathroom.

8-Room House



All mirror lighting is recessed as shown to give full illumination to face.



In non-utility rooms the lighting is built in with ornamental effect as shown in the front hall.

For general illumination cove lighting is used at each end of the living-room with 50-watt lamps on 6-in. centers in mirrored glass reflectors and covered by milky white removable glass panels. These panels are $4\frac{3}{4}$ -in. wide and $11\frac{1}{2}$ -in. long.

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Thirty 25-watt lamps in different colors are concealed behind an etched glass plate for the main dining room light. These provide one intensity of amber, one of blue and two of white light. Small brackets 18-in. from ceiling with 25-watt flame tint lamps are in the corners for ornamental purposes while a daylight effect is given to the windows by 25-watt tubular lamps on 10-in. centers behind opal panels built into the window frame.



Demand Calculations for Feeder Sizes

By Lionel G. Gale,
Chief Electrical Engineer,
James Wilkinson & Company,
Boston, Mass.

It has been the custom for feeder sizes to be figured on the actual connected load, when known; or by an approximation, based upon the engineer's or contractor's experience. Many plans from which the contractor prepares estimates show only lighting outlets, heating outlets, and motor sizes and locations (sometimes the motor sizes are omitted) and call for the contractor to figure "all wiring as required by the Code."

While this, of course, means figuring the minimum required, the good salesman can often sell a higher priced contract, by pointing out to the building owner or tenant, that 10 percent more spent for heavier feeders in the beginning, will save 40 or more percent when an additional load in the picture requires increased mains.

To the contractor or engineer who has the opportunity to prepare the plans and specifications, I want to emphasize the desirability of providing for future loads.

Each year, electric cooking, refrigeration, air conditioning, architectural (built-in) lighting, and flood-lighting are increasing the electric loads in all types of buildings. Many installations of new equipment are lost each year, because no

TABLE A, LIGHTING—WATTS-PER-SQUARE-FOOT AND DEMAND FACTORS

Class of Building	Rule No.	Minimum watts per sq. foot	Add for	Demand Factors		
				1	2	3
Single Family Dwellings	2011 d 4	1	Appliances 1000 watts	1st. 2000 sq. feet 100%	In excess of 2000 sq. feet 60%	
Multi-family Dwellings and Apartment Hotels	2011 d 5 & d 6	1	Appliances 1000 watts each apartment.	1st. 2000 sq. feet 100%	In excess of 2000 sq. feet 1 to 10 Apts. 70% 11 to 40 Apts. 60% over 41 Apts. 50%	
Hotels	2011 d 7	1	Ballrooms, signs, and other special conditions.	First 10,000 sq. feet per feeder. 100%	Over 10,000 and less than 50,000 sq. feet per feeder. 80%	In excess of 50,000 sq. feet per feeder. 70%
Stores	2011 d 8 & d 9	2	Counter cases 25 watts per linear foot; Wall or standing display cases 50 watts per linear foot; Show windows 200 watts per linear foot; Signs, and other special conditions.	100% for entire area per feeder.		
Office Buildings	2011 d 10	2		1st. 10,000 sq. feet per feeder 100%	In excess of 10,000 sq. feet per feeder 70%	
Industrial Commercial (Loft) Buildings	2011 d 11	1		100%		
Garages	2011 d 12	1	Machine Shop, Display Rooms, Signs, and other special conditions.	100%		
Hospitals	2011 d 13	1	Operating suites, and X-ray dept.	1st. 25,000 sq. feet per feeder 100%	In excess of 25,000 sq. feet per feeder 60%	
Schools	2011 d 14	1 1/2		1st. 1000 sq. feet per feeder 100%	In excess of 1000 sq. feet per feeder. 50%	
Storage Warehouses	2011 d 15	1		1st. 50,000 sq. feet 100%	In excess of 50,000 sq. feet per feeder. 50%	
Factory and other Buildings.	2011 d 16 & d 17		Feeders for theatres, churches, and other places of public assemblage, ballrooms, dance halls, restaurants, club and lodge rooms, community centres, armories, libraries, operating suites and X-ray departments in hospitals, etc., and buildings for special purposes, such as banks, motion picture studios, etc., for flood and outline lighting, and electric signs,—shall be determined by the specific load they serve and as ordinarily computed.			

Total square feet to be gross area determined by the outside dimensions of the building and the number of floors. Unoccupied cellars, unfinished attics, and open porches, need not be included.

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TABLE B—AMPERES PER LEG OF FEEDER FROM WATTS
(power factor not considered)

Current Characteristics	Formula
115 volts, 2 wire, A. C. or D. C.	$\frac{\text{Watts}}{115} = \text{Amperes}$
230 volts, 2 wire, or 115/230 volts, 3 wire, A. C. or D. C.	$\frac{\text{Watts}}{230} = \text{Amperes}$
120/208 volts, 4 wire, 3 phase, A. C.	$\frac{\text{Watts}}{3 \times 120} = \text{Amperes}$
115 volts, 3 wire, 3 phase, A. C.	$\frac{\text{Watts}}{3 \times 115} = \text{Amperes}$
115/230 volts, 5 wire, 2 phase, A. C.	$\frac{\text{Watts}}{2 \times 220} = \text{Amperes}$

provision was made for such future loads. Personally, I know of many instances where the cost of increased feeders and new services was greater than the cost of the new equipment that the owner desired to install. As a result the owner frequently has decided to continue along with inadequate lighting and ventilation, gas for cooking, and ice for refrigeration. The amount of potential business lost each year to the electrical industry, in all branches, because of lack of planning for the future is immeasurable. Adequate capacity in service and feeders is essential and saleable and should be given consideration in every layout.

Lighting Feeders

Recognizing that it is usually impossible to determine the actual load that will be connected to the lighting feeders the National Electric Code has attempted to give watts-per-square-foot factors from which approximate loads may be figured. Further realizing that measured demand factors are not obtainable in advance, the Code gives various "calculated" demand factors. The product of the area per feeder, the watts-per-square-foot factor, and the demand factor, will give the load in watts per feeder.

In this article we will not consider the voltage drop due to length of feeders. Section 2011-b of the Code recommends that the feeder conductors be of such size that there be not more than 3 percent voltage drop after demand has been applied.

To easily figure lighting feeders a form similar to Form 1 of this ar-

ticle should be prepared in advance. This form, and Forms 2 and 3, can be easily printed. Space should be left for additional feeders. If the job is not strictly competitive provi-

sion for future loads should be made, by increasing the wire sizes by at least two, and the conduit size by at least one.

The method of procedure should be:

1. Fill in class of building, current characteristics, the feeder number, the panel fed, and the area fed.

2. By reference to Table A of this article fill in the watts-per-square-foot and demand factors, and the areas to be computed. Determine the multipliers and the products of the multipliers times the areas to be computed.

3. Fill in the wattages for additional loads, such as signs, appliances, showcases, etc.

4. Total the wattage and divide by the voltage or voltage \times phase (refer to Table B of this article), which will give the amperes per leg of feeder.

5. If the feeder is a combined Light and Heat, or Light and Power,

FORM 1

LIGHTING FEEDER CALCULATIONS						
Class of Building; <i>School.</i>						
Current characteristics; <i>115/230 volts, 1 phase, 3 wire, 60 cycle, A. C.</i>						
Feeder Number		<i>1</i>		<i>2</i>		<i>Service</i>
Feeding Panel Number		<i>L1 & L2</i>		<i>L3 & L4</i>		<i>Main Subd.</i>
Square feet of Area Fed.		<i>20000</i>		<i>40000</i>		<i>60000</i>
Refer to Table A	Watts per Sq. Ft.	Demand	Multiplier			
First 10000 Square Feet	<i>1.5</i>	$\times 100\%$	$= 1.5$	$\times 10000 = 15000$	$10000 = 15000$	$10000 = 15000$
Balance	<i>1.5</i>	$\times 50\%$	$= .75$	$\times 10000 = 7500$	$30000 = 22500$	$50000 = 37500$
Additional Load	<i>Signs</i>			<i>5000</i>	<i>.....</i>	<i>5000</i>
TOTAL LOAD				<i>27500</i>	<i>37500</i>	<i>57500</i>
Divide by Voltage or Voltage \times Phase Refer to Table B				<i>230</i>	<i>230</i>	<i>230</i>
To get AMPERES (Lighting)				<i>120</i>	<i>163</i>	<i>250</i>
If Combined HEAT AMPERES				<i>26</i>	<i>.....</i>	<i>26</i>
Feeder, add for— LIGHT AMPERES				<i>.....</i>	<i>20</i>	<i>20</i>
TOTAL AMPERES PER FEEDER				<i>146</i>	<i>183</i>	<i>296</i>
Obtain FEEDER size from Table 612 of "Code"				<i>3 #00-2"</i>	<i>3 #4/0-2 1/2"</i>	<i>3-300000CM-S"</i>

Note: Figures in italics are calculations to show use of form.

or Light, Heat and Power Feeder, add the various ampere values and then obtain the feeder size.

6. Obtain the feeder size from Table 612 of the Code.

Heating Feeders

Heating feeders may also be easily calculated in a similar manner to lighting feeders by using Form 2. The method of procedure in the case of heating feeders should be:

1. Fill in current characteristics, feeder number, and panel fed.

2. Schedule the various sizes of ranges and heating appliances on the job.

3. List the quantity of each size range and appliance per feeder.

4. Determine and list the products of the last two items, that is, multiply the number by the size of each range.

5. Total the connected load in watts, and multiply by the demand factor (obtain from Code rule 2011d18), which gives the total calculated load per feeder, in watts.

6. Divide this product by the voltage or voltage \times phase, which gives the amperes per leg of feeder. Then proceed as under lighting feeders.

Power Feeders

To figure power feeders a different method of procedure is more satisfactory, in that the load on each panel should be figured separately as shown on Form 3.

1. List the current characteristics, the panel and circuit numbers, and motors and their sizes in horsepower.

2. From Tables 2, 3, 4, or 5, of Section 808 of the Code, list the full load currents of the various motors.

3. From Table 1, columns 7, 8, or 9, of Section 808 of the Code, list the rating of the branch circuit fuses and the size of the branch cutout base. From columns 2, 3, or 4, list the wire sizes of the various motor branches.

4. Total the full load current (amperes).

5. To the total full load current, add 25 percent of the full load of the largest motor (Rule 808a11), which gives the amperes per leg of feeder. Then proceed as under lighting feeders.

The fuses protecting the feeders shall not be greater than the largest branch circuit fuse fed by the feeder, plus the sum of the full load currents

FORM 2

HEATING FEEDER CALCULATIONS

Current characteristics; 115/230 volts, 1 phase, 3 wire, 60 cycle, A. C.

Feeder Number	1		2		Service	
Feeding Panel	H1		H2		Main Subd.	
Wattage of Range or Appliance	No. of Ranges		No. of Ranges		No. of Ranges	
1000	6	6000	10	10000	16	16000
5000	4	20000	6	30000	10	50000
10000	5	50000	2	20000	7	70000
Total Ranges and Connected Load in Watts	15	76000	18	60000	33	136000
Multiply by Demand Factor (Rule 2011 d 18)		.40		.37		.30
To get Total Load in Watts		324000		22200		40800
Divide by Voltage, or Voltage \times Phase		230		230		230
To get Load in AMPERES		141		96		177
Obtain feeder size from Table 612 of "Code" or transfer to Lighting Feeder sheet, if combined feeder.		3 #00-2"		3 #1-1½"		3-200000CM-2"

Note: Figures in italics are calculations to show use of form.

of the other motors fed. In the $225 + (9 + 15 + 27 + 15) = 291$ amps. specimen Form 3 filled in, these for which a 300-amp. fuse and a 400-amp. cutout base is selected.

FORM 3

POWER FEEDER CALCULATIONS

Current characteristics; 230 volts, 3 wire, 3 phase, 60 cycle, A. C.

The fuse sizes are for branch circuit protection, not for running protection.

Panel No.	Circuit No.	Feeding	H.P.	Full Load Current (amperes)	Fuse Size (amps.)	Cut-out base size.	Wire and Conduit Size
1	1	Fresh Air Fan	3.	9.	30	30	3 #14-½"
	2	Sump Pump	5.	15.	45	60	3 #12-½"
	3	Vent Fan #1	10.	27.	70	100	3 #8-3"
	4	Vent Fan #2	5.	15.	45	60	3 #12-½"
	5	Elevator	40.	101.	225	400	3-#00-2"
	6	Spare	..	..	..	60	
Totals			63	167			
Plus 25% of largest motor				26			
Total for feeder				193	300	400	3-200000-2½"

Note: Figures in italics are calculations to show use of form.

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What It Costs to Prepare Estimates

By Ray Ashley

CAREFUL records of the time spent in estimating a very large number of jobs reveal some average costs for estimating electrical work which should prove of interest to electrical contractors, particularly now when such a small percentage of projected jobs are actually let. The figures also reveal a large waste in the electrical contracting industry in the preparation of estimates when a large number of bidders are independently figuring on the job.

In presenting the data in the accompanying tables the cost of estimating was confined entirely to the amount paid to the estimators for the time that they spent preparing the figures. These costs do not include any overhead such as rent, light, telephone, stenographic work, supplies, etc., nor do they include any charges for checking, supervision pricing or making extensions. These figures were taken from the records of a central estimating bureau which, because of the volume of work, was able to keep its estimators fully occupied. Moreover these men were required only to do the estimating. For that reason the costs shown in the accompanying tables might be considered low.

An analysis of 1,000 jobs of all types disclosed that the expense of pricing material and making extensions averaged approximately 0.1

percent of the estimated cost of the job. This figure should be added to the percentages in the accompanying tables to arrive at a completed cost for estimating, exclusive of overhead.

The percentages in the tables are based entirely upon the estimated cost of materials, labor and direct job expense.

The last item shown in Table I (1000 projects of all kinds) included every job that was turned into this central estimating bureau, between Oct. 7, 1930, and March 27, 1931. Analysis of these jobs showed the following figures:

Number of jobs which went ahead	619
Number of jobs which did not go ahead	381
Total number of jobs estimated	1000
Estimated cost of jobs which went ahead	\$1,958,377.00
Estimated cost of jobs which did not go ahead	564,538.00
Total estimated cost (1000 jobs)	\$2,522,915.00
Portion of work which went ahead	78%
Total number of bidders (known)	1876
Average number of bidders per job	1.876
Cost of estimating—	
Estimator's time (per \$1000.00)	\$8.00
Pricing Mat., Extensions and Checking per \$1000.00	1.00
Total cost per \$1000	\$9.00

Taking the cost on the basis of \$1,000 worth of work estimated, and using the above figures, we can establish an approximate cost for figuring

the work when done by each contractor.

If it cost \$9.00 per thousand to get out an estimate and if only 78 percent of the work went ahead, then the \$9.00 would only pay for \$780.00 worth of work which went ahead. On the basis of the number of bidders (1.876 per job) it is seen there would be spent $\$9.00 \times 1.876$ or \$16.88 for each \$780.00 worth of work let. This would make the actual cost of estimating approximately 2.16 percent. In other words, we would have to increase our costs shown in the tables more than two times to get the contracting industry's cost.

The average number of bidders runs much lower when all types of buildings are taken into consideration due to the large number of small residences and small jobs which only have one bidder. On the other hand, for large work such as factories as shown in Table 3, the number of bidders on a single project is larger. There is one project on record which had thirty-four bidders. The estimated cost was approximately \$26,000 and the cost of estimating was \$135.00. Now if each bidder had estimated the job independently at the same average cost, the total amount spent for estimating the job would have been \$4,590.00 or 17 percent of the estimated cost of the job.

TABLE 1. COST OF ESTIMATING ELECTRICAL WORK

TYPE OF INSTALLATION	No. of Proj. Analy.	SIZE OF PROJECTS (Estimated Prime Cost)				ESTIMATING COST				PERCENTAGE OF PRIME COST FOR ESTIMATING		
		Maximum	Min.	Average	Total	Hours	Av. Rate	Total Cost	Cost Per \$1000	Maximum	Minimum	Weighted Av.
1—Alterations (Small)	18	\$ 745.00	\$ 98.00	\$ 384.00	\$ 6,930.00	109	\$1.48	\$ 161.30	\$23.30	6.30	0.60	2.33
2—Alterations (Large)	12	36,637.00	876.00	5,687.00	68,244.00	307	1.41	432.80	6.35	1.70	0.60	0.64
3—Apt. Bldgs (Over 6 Apt.)	20	23,136.00	657.00	3,434.00	68,684.00	261	1.47	384.00	5.60	2.10	0.23	0.56
4—Churches	5	4,586.00	284.00	2,060.00	10,300.00	71	1.48	105.00	10.20	1.52	0.62	1.02
5—Factories	12	25,734.00	243.00	5,254.00	63,048.00	222	1.73	384.00	6.10	4.70	0.25	0.61
6—Gas & Service Stations	30	3,292.00	94.00	808.00	24,240.00	191	1.51	289.00	11.90	2.00	0.90	1.19
7—Hospitals	5	26,800.00	2,352.00	14,501.00	72,505.00	161	1.67	269.00	3.70	1.75	0.18	0.37
8—Hotels	6	105,659.00	3,822.00	31,008.00	186,048.00	243	1.57	381.00	2.05	0.94	0.09	0.21
9—Office Buildings	8	714,744.00	657.00	94,895.00	759,160.00	503	1.80	905.00	1.18	1.20	0.09	0.12
10—Residences & Small Apts.	30	1,770.00	93.00	474.00	14,220.00	117	1.48	173.00	12.20	2.16	0.40	1.20
11—Schools & Libraries	12	26,364.00	342.00	5,182.00	62,184.00	248	1.61	399.00	6.40	1.75	0.24	0.64
12—Stores	30	17,043.00	114.00	1,462.00	43,860.00	253	1.64	415.00	9.50	3.00	0.55	0.95
13—Theatres	8	37,686.00	1,100.00	10,370.00	82,962.00	181	1.60	290.00	3.50	1.36	0.12	0.35
14—Miscellaneous	50	438,735.00	116.00	14,645.00	732,280.00	1,165	1.58	1,841.00	2.50	3.40	0.07	0.25
15—All Types of Elec. Const.	1000	110,275.00	73.00	2,522.91	2,522,915.00	13,112	1.54	20,190.00	8.00	.....	.....	0.80

NOTE—The above costs represent the estimators' time only and do not include the cost of pricing, extending, checking, and other overhead items.

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These figures are of even greater importance today because of the much smaller percentage of projected work that is completed. If, as has happened in some instances, less than 10 percent of the projected work is actually completed and if the average number of bidders is increased as is now the condition, it becomes obvious that the cost to the electrical contracting industry for preparing estimates reaches a very large percentage when compared with the volume of work actually let. It would seem that these figures might reveal the necessity for some different manner of handling estimating, particularly today when so many architectural offices are putting out plans with no particular intention of letting the work at this time. In other words, it would appear that there is considerable testing of market prices today with the contractors furnishing the bids absorbing the cost of providing this service for architects and builders.

The average number of known bidders on special projects listed in Table 1 ran as follows:

TABLE 3, NUMBER OF BIDDERS

Alterations—(small)	2.2
Alterations—(large)	4.4
Apartment Buildings (over 6 Apt.) ..	2.4
Churches	6.0
Factories	5.6
Gas and Service Station	2.2
Hospitals	5.0
Hotels	7.3
Office Buildings	7.0
Residences and Small Apartments ..	1.6
Schools and Libraries	5.4
Stores	2.6
Theatres	4.0
Miscellaneous	4.5
Average	4.3

The number of bidders is largely dependent on the source of the requests. They usually come from the architect or engineer, a general contractor, or the owner. The records were not checked to see how the number varied when coming from these various sources, but it is a well known fact that general contractors get more bids than either the owner or the architect. The owner and the architect are both primarily interested in getting the job done by a reliable contractor at a reasonable price. They will select contractors and usually let the job to the lowest reliable bidder.

There is probably no other branch of construction connected with a building, which for the amount involved requires as much time and work for estimating as the electrical. The work is scattered all over the building and

TABLE 2. COST OF ESTIMATING ELECTRICAL WORK IN FACTORIES

Project Analyzed	No. of Bids	Work Completed	Work Not Completed	ESTIMATING			
				Hours	Rate	Cost	Per Cent of Prime Cost
A	1	\$ 653.00	.....	7½	1.55	\$ 11.60	1.78
B	2	.....	\$ 7,569.00	12	1.55	18.70	0.25
C	3	1,058.00	.....	5	1.90	9.50	0.90
D	3	.....	1,073.00	11½	1.65	19.00	1.78
E	34	25,734.00	.....	67½	2.00	135.00	0.53
F	7	2,540.00	.....	21	1.55	32.55	1.28
G	1	.....	1,623.00	10	1.55	15.50	0.96
H	2	.....	243.00	5	.90	4.50	1.85
I	8	10,672.00	.....	21	1.25	26.25	0.25
J	1	7,361.00	.....	10	1.90	19.00	0.26
K	6	3,479.00	.....	25	1.80	45.00	1.30
L	1	1,040.00	.....	27	1.80	48.60	4.7
Total	69	\$52,537.00	\$10,508.00	222½	.....	385.20	.....

No. of Projects—12

Total Cost, \$63,045.00

Average Cost \$5,253.75

Average Cost of Estimating 0.61%

Average No. of Bidders—5.6

Average Cost of Estimating Compared with Completed Work 0.73%

usually hard to take off. Specifications that have to be read and studied are much longer in proportion to the cost of the work, and generally more complicated than those for other trades. Very few jobs have enough purchased material to bring the cost of material far above the labor cost.

The jobs used for compiling the tables were taken just as they appeared in the files, and are a very good representation of the types of work which have to be figured from year to year. It will be noted that there is a wide variation between the minimum and the maximum costs for all classes of buildings. From Table 2, which shows the method used for compiling Table 1, we see that this variation does not necessarily depend on the size of the project. A great deal of this difference depends on how complete the plans and specifications are. A set of plans and specifications which make it necessary for the estimator to figure out the circuits, and feeders will naturally cost more to estimate.

In general, the average costs have about the variation that one would expect. Naturally, small alterations will cost more than any other type of work. Much time is consumed in going to the job and examining existing conditions. As the estimator develops his figures, it is necessary for him to spend much time contemplating possible methods of procedure of other trades and their effect on his work. In figuring large alterations, the cost of examining existing conditions is not so great in proportion as it is for the small jobs, and the

amount of new equipment usually helps keep down the cost of estimating.

Nor does the percentage for estimating necessarily run in proportion to the complications of the work. Hospitals usually involve a great deal of work for estimating, yet the cost per \$1,000.00 runs low. This is due to the amount of purchased equipment, such as nurses' call, doctors' paging, and other systems which involve considerable money.

The amount spent for estimating can be controlled somewhat by exercising good judgment in selecting the jobs to be figured. Many contractors think that they should figure every job that they can get plans for. Such contractors are sure to be given jobs to figure which neither the owner nor the owner's representative have any intentions of awarding the contract to them. Other contractors want to keep their estimators working up to capacity all the time. There is a limit to how much good work an estimator can do, and if he wears himself out figuring jobs that his firm is not in a position to get, he may not be able to do justice to the good jobs.

Estimating electrical work is an expensive, but a very vital part of contracting. Economy may be effected by selecting the proper type of estimators and the jobs that are to be figured, but it is false economy to try to save money by rushing figures through to avoid hiring more estimators. Regardless of expense, cost figures are worthless if they can not be depended on.

Explosion Proof Wiring—VI

Questions and Answers Regarding Electrical Installations in Hazardous Locations

By C. W. Gustafson,

Chairman, Article 32 Committee, N.E.C.

IN this, the concluding installment of this series of articles, a number of the most frequently asked questions pertaining to the application of Article 32 will be answered. It must be realized that some of the questions, particularly those concerning the existence and extent of a hazardous area, must be answered in a more or less general manner. However, it is hoped that the answers given will prove sufficiently definite to be of assistance.

How can one determine whether or not a motor, controller, lighting unit, or other piece of apparatus intended for installation in a hazardous location is approved?

In general, inspection authorities regard the label of Underwriters' Laboratories on electrical devices evidence that such devices are worthy of approval. Devices listed for hazardous locations will be found to carry labels stating the class and group for which the particular device has been tested and found suitable. For instance, a label carrying the legend, "Listed for Hazardous Locations, Class I, Group D" signifies that the device is worthy of approval for use in atmospheres containing gasoline vapor and vapors or gases of equivalent hazard.

Who is to judge whether a certain premise is a hazardous location?

The authority enforcing the Code is charged with the duty of judging whether or not the hazardous conditions defined in the first section of Article 32 are present in a given premise. Owing to the wide variety of types of hazardous industries and processes and the varying conditions present in each, it would obviously be impracticable to include in Article 32 specific rules naming each in-

dustry and process and the probable extent of the hazardous area.

Outside of his own opinion, how could an inspector determine whether vapors or dust are present in dangerous quantities?

Actually, the inspector should regard the presence of any amount of vapor, gas, dust, or lint, sufficient grounds for placing the particular premises involved in the hazardous class. This is especially true where natural or artificial ventilating systems are depended upon for the removal of vapors, gases or dusts, as the failure of ventilating systems, changes in wind velocity or humidity and other factors may render a relatively safe location decidedly hazardous. In other words, the inspector should lean towards safety rather than placing too much confidence in the maintenance of proper ventilation, housekeeping, and general upkeep.

In an automobile repair shop where pyroxylin spray painting is done, how far from the spray booth should the hazardous area be considered to extend?

The extent of the hazardous area surrounding a spray booth is a matter subject to the judgment of the inspection authority. In some jurisdictions, however, the hazardous area has been arbitrarily assumed to extend to a distance of 25 ft. from the booth. With booths of modern design and with proper ventilation this assumption can be safely made. When less modern or no booths are used and when adequacy of ventilation is questionable, the inspector is justified in extending this area.

Are garages to be considered as hazardous locations and be made subject to the rules of Article 32?

Garages are not intended to be regarded as coming under the rules of Article 32. Rules for electrical wiring and apparatus in garages will be found in Article 33.

In the definition of Class II locations, why is there a distinction made between those where dust is likely to be present in suspension in the air in quantities to form an explosive mixture and those where it is impracticable to prevent accumulations of dust in such quantities as to prevent radiation of heat properly from motors and other devices?

In modern flour mills, feed mills and grain elevators having complete dust control systems excessive accumulations of dust are unlikely and yet there may be sufficient dust in suspension in the air to form an explosive mixture. Under such conditions, the rules permit the installation of open squirrel cage motors (non-sparking type) and yet require protection against the presence of sparks or arcs which might occur during normal operation such as at motor brushes, contactors, etc. In plants not having such dust control systems, it is a difficult matter, at least in some locations, to prevent the accumulation of dust in quantities sufficient to prevent normal radiation of heat. In any event, however, the inspector should assume conditions at their worst for changes in management or supervision, or failure of the dust control system, may render a normally clean plant excessively dusty.

Is a liquor distillery to be considered a hazardous location? If so, what departments are to be so considered and in what class should each be placed?

There are several locations in liquor distilleries which are subject to clas-

sification as hazardous locations. Among the possible Class I locations are the still and column rooms, the sight box room, the cistern room, and probably the rack house. The grain elevator, the mill or grinding department, and the feed department where the spent grain is dried and packed should be considered as Class II locations. The hazards of distilleries varies with the "proof" of spirits manufactured or handled. Many, if not most distilleries, now produce 190 proof spirits for blending purposes and as this is almost absolute ethyl alcohol, the hazards are obvious. There seems to be a wide variance of opinions regarding the degree of protection needed in distilleries but owing to the very high values involved, especially in the rack houses, it would seem desirable to insist on the highest grade apparatus and wiring in all locations where there is any likelihood of alcohol vapors being present.

Are wool and silk to be considered combustible fibres?

Wool and silk are generally not easily ignitable and when ignited do not burn rapidly. For these reasons they are not considered combustible fibres within the meaning of Article 32.

At what points do the rules for Class I locations require sealing? Is such sealing required by the rules for Class II locations? If not, why not?

The rules for Class I locations require that conduit be sealed off at motor terminals, controller and switch cases, lighting units, and other similar points where arcing or sparking is likely to occur. It is also required that when a run of conduit extends from a hazardous to a non-hazardous location, the conduit be sealed off at the division point between the two locations. Attention is directed to the discussion and illustration on this question which appeared in the third installment in this series. Such sealing is not required in Class II locations for the reason that the diffusion of dust through a conduit system would be negligible.

Are sealing compounds of suitable type readily available?

Several manufacturers in submitting sealing fittings to Underwriters' Laboratories included suitable compounds to be used with the fittings. These compounds may be purchased directly from the manufacturers. A

mixture of litharge and glycerine has been used to a considerable extent and, being insoluble in gasoline, is suitable for use where the vapors of this liquid are present.

Are threadless fittings permitted in Class I locations?

The rules for Class I locations specify that joints in conduit and fittings used with it be explosion-proof. So far, an explosion-proof threadless coupling or fitting has not appeared. Ordinary threadless fittings are not approved for use in Class I locations.

Why is it not permissible to install electrical equipment such as lighting fixtures and motors in pyroxylin spray booths, if such equipment is of the explosion-proof type?

In spraying articles with pyroxylin spray, a fine dust residue of a highly combustible nature is deposited within the booth. This residue has been known to break down and ignite at temperatures as low as 212 deg. F. or at temperatures much below that attained by the exterior of enclosed lighting fixtures or the frames of overloaded motors, hence the need for excluding all electrical apparatus from spray booth interiors.

Is a motor listed by Underwriters' Laboratories for Class I locations permissible for installation in Class II locations?

A Class I motor is not necessarily dust-tight and therefore should not be accepted for Class II locations unless a dual listing for both Class I and Class II has been obtained.

May an open squirrel cage motor be installed in a flour mill or an open wound rotor motor having unenclosed slip rings?

The rules for Class II locations permit the installation of open squirrel cage motors (non-sparking type) in those locations in a flour mill where the inspector is assured that accumulations of dust in the motor will not be sufficient to prevent proper radiation of heat. A wound rotor motor with unenclosed slip rings is not permitted to be installed in the flour mill proper unless within a separate motor room of proper construction. The rules recommend that all motors, regardless of type, be of the enclosed type or be enclosed in standard motor rooms as described in the fourth installment of this series.

Do the rules for Class II locations apply to cement plants? If not, does

the Code provide for the protection of motors in such plants against dangerous accumulations of dust?

The rules for Class II in Article 32 do not apply to electrical installations in cement plants inasmuch as cement is not a combustible dust. Where motors in such plants are subject to excessive accumulations of dust, the protection of the motors is provided for in Section 1003 of Article 10. This prescribes safeguards identical with those in rules for Class II.

Is it required that all fixed lighting units in Class II locations be protected by guards?

Only those fixed lighting units which are exposed to mechanical injury are required to be equipped with guards in addition to the dust-tight outer globes when such units are installed in Class II locations. While this matter is left to the judgment of the authority enforcing the Code, guards should be required on all lighting fixtures with the exception of those which may be mounted on high ceilings well out of reach.

Does the term "vapor-proof" have any significance as applied to lighting fixtures for use in Class I locations?

The term "vapor-proof," while not now defined in Article 1 of the Code, was a term originally applied to lighting fixtures, etc., intended for use in damp or wet locations such as boiler houses, pump houses, out of doors, and similar places. The term has no significance as applied to lighting fixtures for Class I locations as the so-called "vapor-proof" fixtures are by no means "explosion-proof."

Are running threads permitted for connecting runs of conduit in Class I locations?

Because running threads must be tapered and rather deeply cut, connections using them will usually not be found to be explosion-proof and therefore they should not be permitted. There are available explosion-proof unions of the straight and swing type which makes it possible to effect connections in conduit without resorting to running threads.

Are lighting fixtures within gasoline pumps, such as those used for illuminating the dials, required to be of the explosion-proof type? The dome lights?

Inasmuch as the interior of a gaso-

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line pump is considered a Class I location, lighting fixtures within it are required to be of the explosion-proof type. However, the standards of Underwriters' Laboratories do not yet require such lights, for instance those used for illuminating dials, to be of the explosion-proof type, but it is thought that this will be a requirement in the near future. Dome lights may be of the ordinary type but the lower portion should be sealed off from the pedestal interior to prevent accumulation of vapor within the globe and to prevent sparks or heated metal from falling into the pedestal in event of breakage.

Is it necessary to provide a bonding jumper from the frame of a motor in a Class II location to the rigid conduit when a short length of flexible steel conduit is used at the motor terminals?

As ordinarily installed, flexible steel conduit at motor terminals is attached to the terminal box by means of a locknut and bushing and to the rigid conduit by means of a clamping device. Under such conditions, the rules in Article 32, Class II locations require a bonding jumper from the frame of the motor to the rigid conduit.

Are fittings, such as "ells," junction or pull boxes, and similar enclosures required to be of the dust-tight type when used in Class II locations?

The rules for Class II locations do not require that fittings, junction boxes, pull boxes and similar enclosures be dust-tight unless they contain arcing or sparking contacts or devices which tend to create high temperatures while in normal operation.

Is specially listed equipment available for Class III and Class IV locations?

Underwriters' Laboratories do not list equipment specially for Class III and Class IV locations. Inasmuch as the rules for these classes specify dust-tight equipment, it was felt that Class II equipment was satisfactory for use in the type of locations described in Class III and Class IV.

Are motors installed in Class III locations required to be of the enclosed type or be enclosed?

In Class III locations any motor having brushes or sliding contacts (a sparking motor) is required to (1) be of the enclosed type, or (2) be enclosed in a standard motor room,

or (3) have such brushes or sliding contacts enclosed in substantial dust-tight housings. Motors of the squirrel cage type or others not having brushes or sliding contacts may be installed without enclosures unless such motors are located in a place where they will be subject to dangerous accumulations of lint, such as in cotton gins, and in the cleaning and linter rooms of cotton seed oil mills. In the latter case the motors are required to be of the enclosed type or be enclosed in standard motor rooms.

Why is the term "dust-tight" employed in the rules for Class III and Class IV locations when these classes deal with combustible fibres?

The term "dust-tight" is used in connection with the rules for Class III and Class IV locations because in many instances the lint or flyings approach dust in degree of fineness and to keep such lint or flyings from entering switch cases, etc., requires an enclosure practically as tight as one required to exclude dust.

How should resistance devices in Class IV locations be protected?

Resistance devices in Class IV locations, unless in rooms equivalent in construction to standard motor rooms, are required to be enclosed in metal cases of dust-tight design and, in addition, shall be so constructed that ignition of lint by direct contact with the case, whether in normal operation or in case of fault, be avoided. This can be accomplished by enclosing the inner case in a second of larger size and so reduce surface temperatures.

What precautions should be observed in the installation of fixed lighting units in Class IV locations?

Fixed lighting units in Class IV locations are required to be located where they will not be injured when bales of fibres are tiered or handled. Further, the lamps and their sockets must be so enclosed that in event of burnout, no spark or hot metal can escape from the enclosure. Suitable protection against the falling of sparks or hot metal from the unit is provided by affixing a piece of wire glass to the under side of the fixture.

Are the switches, push buttons, lamps, bells, and contactors, such as used for signalling purposes in terminal grain elevators, required to comply with the rules for Class II locations?

The rules for Class II locations re-

quire dust-tight globes on lights regardless of their use. It is also required that any device which creates arcs or sparks be enclosed in a dust-tight case. This includes bells, push buttons, switches and contactors used on signal systems in terminal grain elevators.

Are auxiliary gutters permitted in Class II locations?

Auxiliary gutters constructed in accordance with the rules of Article 5 are permitted in Class II locations.

Are standard oil break auto-starters (compensators) suitable for use in Class II locations such as in a terminal grain elevator?

Standard auto-starters in which the main contacts are immersed in oil are not approved for use in Class II locations. The cases of such starters are not dust-tight as required by the rules with the result that accumulations of dust within the case and in the oil tank are probable. Even though the starter is of the oil break type, the enclosing case must be of dust-tight design and construction.

What portions of the usual type of filling station should be regarded as a Class I location?

The Class I hazardous area in a gasoline filling station includes only the interior of the pedestal of the discharge device or pump. It is not considered to extend to the canopy or station shelter.

Are greasing and oil changing pits considered to be Class I locations?

The greasing or oil changing pits in connection with filling or service stations are to be regarded as Class I locations. Where such pits are located in garages, electrical installations in them are subject to the rules of Article 33 covering garages.

On the scale floor of a certain terminal elevator is a tile and concrete room used as an office by the weighmasters. There are no openings into the main building from this room other than a door opening which is protected by a tight-fitting self-closing fire door. Is it permissible to use a radiant type electric heater in such a room?

Weighmasters' offices or similar rooms in terminal grain elevators, if so built as to be practically free from dust, are not regarded as hazardous locations and, therefore, ordinary radiant type electric heaters may be used in them.

electrical contracting

With which is consolidated Electrical Record

S. B. WILLIAMS, Editor

MORTGAGE MONEY

THE most encouraging element in the current news is the attention being given by Washington to the release of money for long term credits. The banks are loathe to make long term loans on their own responsibility but the administration is insistent that money find its way back into the capital goods industries.

A recent survey made by the *American Builder* and another survey made by the National Lumber Dealers' Association disclosed a very large number of residential projects that are ready to go ahead just as soon as mortgage money is available. This situation is fairly general.

It is also known that some building and loan associations are seeking first mortgages on new residences and there also has been some buying of mortgages by insurance interests.

From present indications there will be more credit available for new construction in 1934 than in either of the two previous years. On the other hand it is equally probable that the loaning of mortgage money will be most conservative. This, of course, must mean that the owner will have to put up more cash than he did a few years ago unless someone connected with the construction or sale of the building is willing to take second mortgage paper.

Five years ago such paper could be sold but today it is doubtful if there would be any market except at a prohibitive discount. It, therefore, will be well for a contractor in undertaking to wire any new project to be sure that he is not going to have to finance any of it. If the project does not have its financing all arranged in advance it would be good policy to pass up the job.

MORE LOW PROMOTIONAL RATES

ADVOCATES of low promotional rates for residential service are pleased to note that two large California utility companies have joined the one-cent group.

The San Joaquin Light and Power Corporation and the Pacific Gas and Electric Company now have a one-cent rate for water heating and air heating. It works like this: If a customer has a range he can get most of his energy for water or air heaters for 1 cent per kw.hr. by installing a double-throw switch or a load limiting device set for the maximum load of the range. The one-cent block begins after the customer has used 170 kw.hr.

In addition the San Joaquin Company is going to give all of its domestic customers free in April and May all of the electricity they can use in excess of the amount they paid for in March. The company with water power generation has excess capacity in those months and is taking this means to give customers a taste of the benefits of unlimited service.

Unquestionably such promotional efforts on the part of two great Pacific Coast utilities must result in more business not only for those systems but for the rest of the electrical industry.

LICENSE FEES

NOT so many years ago it was pretty generally felt that licensing was a good thing for the electrical contracting business because the fees could be put high enough to keep out new-comers. As we became more familiar with the true legislative aspects of licensing this idea lost ground, but nevertheless it keeps cropping up.

Licenses are granted for the purpose of protecting the public. The fees are generally what the industry is willing to pay, for after all the body granting the license is not adverse to receiving all the fees it can get.

The fees rightly should be placed at a figure sufficient merely to cover the expense of licensing and examining new applicants. To make the fee larger is merely to levy a tax upon the industry.

High fees do not keep men out of the business. High fees, however, do encourage bootlegging of wiring which is much more serious than having the men in the business legitimately. Under present conditions the courts are apt to be very lenient with such unlicensed work and since there is no

other way in which the work of unlicensed men can be checked up, the lack of licenses is a real menace to the business.

Hundreds, yes thousands, of electrical mechanics are today bootlegging. The work they do is not inspected. If these men were to be licensed there would, at least, be some kind of control over them.

The electrical contracting industry should encourage licensing at a small fee but with an examination that would show the applicant's ability and fitness. There should also be some teeth in the license law whereby the value of the license meant something.

The local contracting industry ought also to make a license mean something to the public. If the public thoroughly understood that uninspected work carried no guarantee of safety there would be less bootlegging.

The license, in other words, no matter how large or small the fee, is of little value until the contractors who want it make it of value.

HOME ELECTRIFICATION

THE modern new house of today differs in many respects from the modern house of 1929. Since the bubble burst there has been a greater amount of attention given to family life and this is finding expression in the design of the modern home.

Work shops with power driven machinery, recreation rooms, more attractive lighting, efficient electric kitchens, air-conditioning are some of the new things in home design.

In every step in new home design electricity is given more consideration with the result that today's new home is different electrically from the new home of the past. There is a necessity today that the wiring be adequate.

The translation of the electrical requirements of the modern home will occupy the pages of the April issues of *ELECTRICAL CONTRACTING* and *Electrical Wholesaling*. In a joint effort to help the new home building market off to a good start so far as the electrification is concerned these two magazines in April will go beyond their own fields to help educate the architect and builder.

With all affected branches of the building industry approaching adequate wiring in the same manner it should not be difficult to give the building public the best of wiring, not only for the present but their future occupancy of these homes.

87 KW. HOME LOAD

AN eight-room house with a connected load of 87 kw. and wired with more than three miles of wire has just been opened in Mansfield, Ohio, by Westinghouse Electric and Manufacturing Company, as a sort of laboratory where appliances and apparatus can be tested under actual use conditions.

There are many things in the house which are experimental and which may or may not find their way into production in the future. The house unquestionably has a greater connected load than the average 8-room well-built home will have for some time.

Nevertheless, dream-like as it is in many respects, a house of this kind typifies the kind of advanced living that is occupying the attention of the industry and it does seem as though some effort might be made by the industry as a whole to take such a house to the public.

This house at Mansfield is, of course, the idea of a single manufacturer. The model kitchens of the General Electric Company at Nela Park in Cleveland are also the ideas of a single manufacturer. Combine these ideas with those of others and we have the electrical industry's idea of a "Home of Tomorrow".

If such an industry idea could be placed before the public, say at the World's Fair this summer in Chicago, the industry would get a quicker expression of public opinion and would quicker sense the public demand.

What does it matter if certain equipment is not available as a manufactured product? Shouldn't we create a desire for things?

It is not enough for one or two progressive manufacturers to build experimental homes for their own use. The public must be made conscious of the comfort and convenience that electricity can give to a home.

MORE INTELLIGENT COOPERATION

IN Duluth, Minn., the local power company encourages the contractors to promote electric cooking by paying the electrical contractor \$13.50 on each range wiring installation in a new house when the customer buys a range. This the contractor gets in addition to his money from the customer for the wiring.

With such a bonus the contractor can afford to spend some time in selling the range wiring and incidentally at the same time pave the way for the sale of an electrical range.





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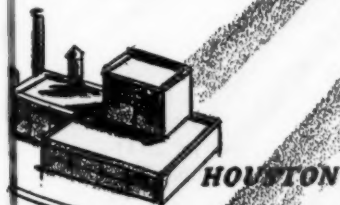
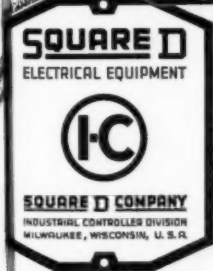
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\\ code chats //

A MONTHLY DISCUSSION OF WIRING PRACTICE AND QUESTIONS OF INTERPRETATION, PRESENTED WITH A VIEW TOWARD ENCOURAGING A BETTER UNDERSTANDING OF THE NATIONAL ELECTRICAL CODE

CONDUCTED BY F. N. M. SQUIRES

CHIEF INSPECTOR, N. Y. BOARD OF FIRE UNDERWRITERS

NEUTRAL GROUNDS

Does 903-b (1931 Code) mean that when an A.C. interior wiring system has a white wire, it must be grounded?

This means that where a system used in a building uses a grounded neutral of the supply system that neutral shall be grounded. Where the grounded conductor is not used in the building neither of the wires need be grounded.

For example, if the supply system is 3-wire single phase and the interior system supplies lights and/or appliances, then the neutral of the interior wiring system must be grounded, but if only 220-volt motors were to be used, the neutral need not be carried into the building and there would be no grounded wire in the building as it would not be proper, nor required, to ground one of the outside wires.

THE USE OF WHITE WIRE

Article 903-a demands grounding of A.C. systems up to 150 volts. It recommends grounding 150 to 300 volts.

Article 2001-f prohibits use of white wire in identified systems (grounded systems) except for the identified (grounded) wire of such system, unless said wire is made un-identified, etc., at outlets, etc.

Is there anything in these articles which prohibits the use of a white wire for the common wire of a 2-phase 3-wire 440 volt system?

Rule 2001-f, as stated above, prohibits the use of a white wire in identified circuits for any conductor, except the grounded one. Neither this rule nor any other one specifies

YOUR QUESTIONS WILL BE ANSWERED

This section of ELECTRICAL CONTRACTING is run solely to clarify the National Electrical Code. If you have any question about the application or the meaning of any part of the Code send your questions to Mr. Squires or to the editor of ELECTRICAL CONTRACTING. Answers will appear in these columns.

nor prohibits the color of the coverings of any of the wires in unidentified circuits.

However, anyone, by just looking at a group of wires, is unable to tell whether or not the wires are in an identified circuit and seeing a white wire in the group would naturally assume that it was an identified system and that the white wire was grounded.

Therefore, the use of a white wire for an ungrounded conductor might present a rather serious hazard.

Probably the intent of the Code should be to have a white covered wire used only for a grounded conductor.

FEEDER SIZES NOT BASED ON NUMBER OF CIRCUITS

Can you give a table of feeder sizes necessary for the following panels, 110-220 volt 3-wire; 4-8-12-16-20-24-28-32-36-40 circuits, single fused and not allowing for voltage drop on account of distance. How do you arrive at these sizes?

The National Electrical Code has no rules for feeder sizes based upon the number of circuits fed from panels. The requirements for feeder capacities is found in Section 2011 in which the requirements are based on

the areas supplied and were originally intended to be applied when it was desired to install feeders smaller than those necessary for the total connected load.

In the above question, therefore, we should not be concerned with the number of circuits on a panel board, but with either the total connected load, or the area supplied. However, one large inspection department sometime ago, adopted a requirement that a riser should be capable of supplying 6 amp. to each circuit supplied and that a main should be figured for at least 5 amp. per circuit. And remember that a demand factor applied to a neutral is only for feeder sizes above 200 amp.

SERVICE AND FEEDER SIZES FOR A GROUP OF HOUSES

In a colored section ten 2-story frame houses, four apartments per house, are to be wired one circuit per apartment with two 40-watt and two 25-watt outlets or 130 watts per apartment. The total load, therefore, is $40 \times 130 \text{ watts} = 5200 \text{ watts}$. Each socket is to be locked to prevent change in load.

What size equipment shall be used for (a) main switch and service wires; (b) sub-feeder block and sub-feeder wires to each row of houses; (c) disconnect switch and fuses for each circuit; (d) master meter loop?

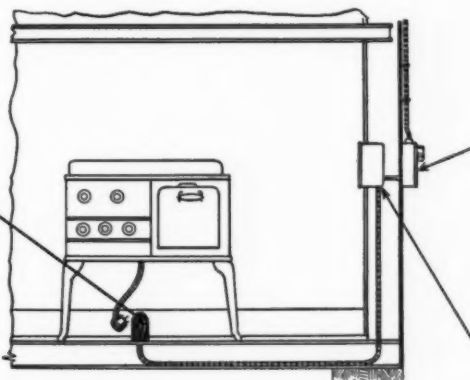
The total load in each house is $130 \text{ watts} \times 4 = 520 \text{ watts}$. As this installation is supplied from a 3-wire system five houses would be connected to each side of the 3-wire service. The total load on each side would, therefore, be 2600 watts or approximately 24 amp. The

Electrical Contracting, March, 1934



— EASY TO WIRE!
— EASY TO LOOK AT!

This Bull Dog RANGE RECEPTACLE



Bull Dog
Outdoor Meter Con-
nection Box

Bull Dog
Combined Service En-
trance Switch, Range
Switch and Lighting
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SUPERIOR WIRING FEATURES of the BULL DOG RANGE RECEPTACLE

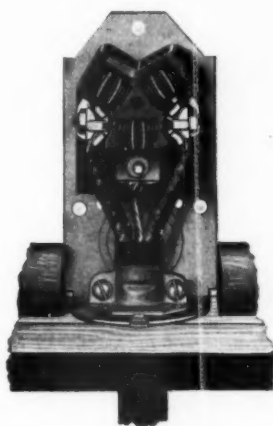
Solderless Wiring Terminals. Wiring Connectors are the Bull Dog Squeeze Type, requiring no solder. They provide better contact and save time and material in wiring.

Improved Cable Clamp. The Clamp may be universally turned to facilitate installation of feeder cable from the bottom through the floor, or from the back through base board. Clamp flange makes effective K.O. closure, thus saving additional exterior fittings.

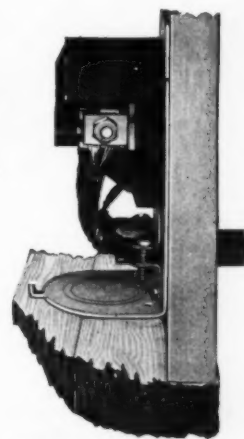
Knockouts. Concentric K.O.'s for $\frac{1}{4}$ "-1" conduit, are standard.

Artistic Design. A Bakelite Cover or front of distinctive modernistic design gives a final touch of quality to this fine Range Receptacle.

*Specified as Standard
By Power and Light Companies.*



Bakelite Cover removed, showing method of installation through the floor and K.O. in Receptacle base.



Bakelite Cover removed, showing method of installation through base-board and K.O. in back of Receptacle.



BULLDOG ELECTRIC PRODUCTS CO.

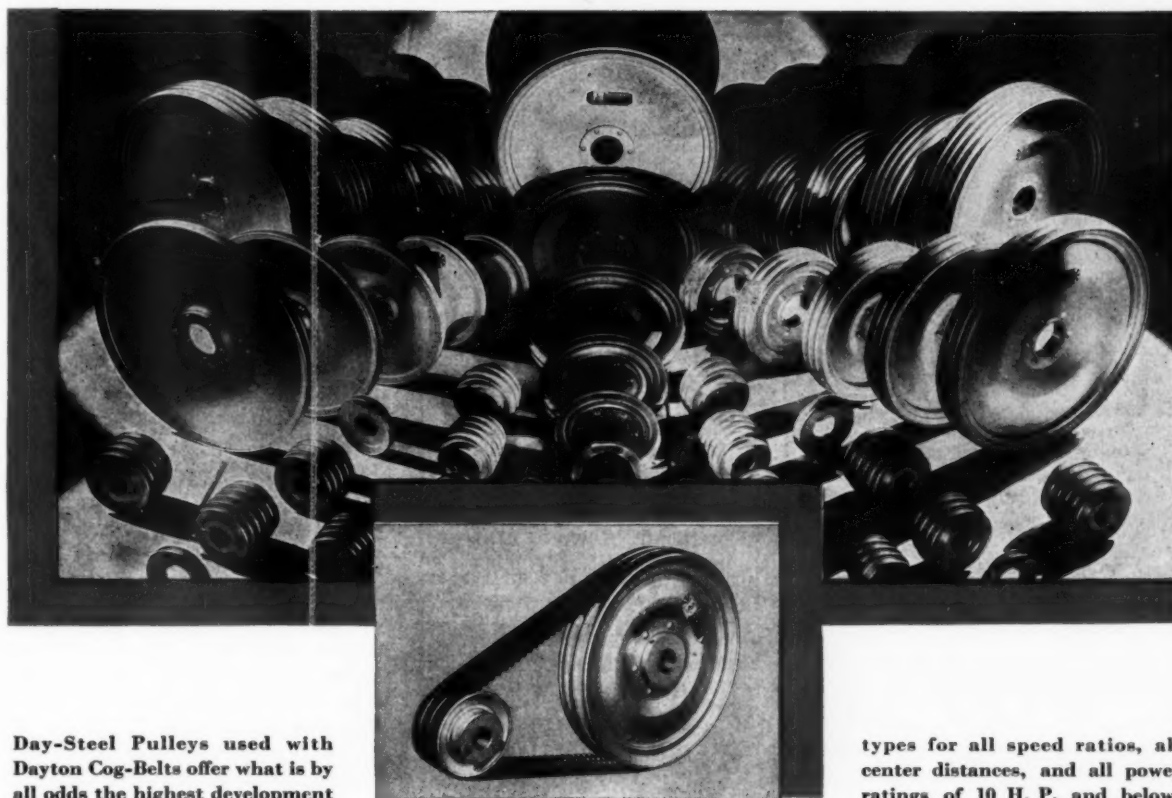
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Day-Steel Pulleys used with Dayton Cog-Belts offer what is by all odds the highest development yet attained in power transmission equipment for all installations up to 10 H. P.

The scientifically designed Day-Steel Pulleys provide new economies and outstanding performance. Their low cost affords real savings on original installation, and maintenance expense is reduced to the minimum.

Correct Drives Quickly Available

These drives are so standardized that the proper equipment for any application can easily be selected without engineering calculation. Furthermore, delivery of the desired Day-Steel Pulleys and Dayton Cog-Belts can be made immediately from stocks in 40 of the principal industrial centers.

Day-Steel Pulleys are accurately formed from heavy-gauge pressed steel. They are light in weight, strong, rugged. Their unique design assures accurate balance and true running. Bushings are interchangeable, providing the right bore for any size of shaft. The pulleys are made with 1 to 6 grooves, giving a complete range of

types for all speed ratios, all center distances, and all power ratings of 10 H. P. and below.

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We invite you to write for Bulletin No. 110, which gives full information about Day-Steel Pulleys and Dayton Cog-Belts. A copy is yours for the asking.

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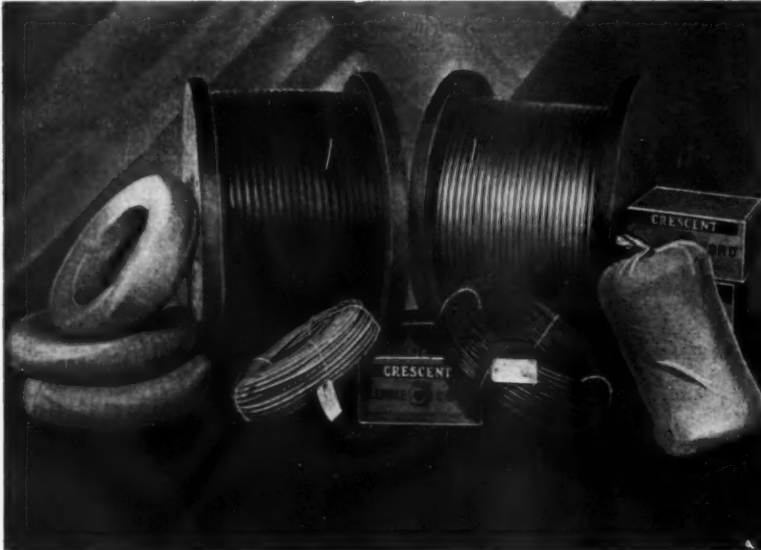
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"Crescent" National Electric Code Rubber Covered Wire and Cable.

Intermediate Grade Rubber Covered Wire and Cable.

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"Crescent" Flexible Metallic Conduit.

"Crescent" Varnished Cambric Cable, Lead Encased or Braided.

"Cresflex" Non-Metallic Sheathed Cable.

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All kinds of special wires and cables.

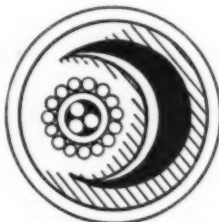
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Pictured above is only a very small part of the wide range of wires and cables that comprise the CRESCENT line.

Warehouse stocks in most principal cities assure quick delivery, and on special orders CRESCENT is able to offer every cooperation. Wholesalers and Contractors may safely turn to the **ONE RELIABLE SOURCE** for every wire and cable need.

45 years of
knowing
how in
every foot of
Crescent Wire



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TRENTON, N. J.

connected on each side of the 110-220 volt 3-wire D.C. or single phase lines. The maximum unbalance would occur when one side of the line is entirely unloaded and the other carrying all of its load.

In the case mentioned, therefore, the maximum load on the neutral would be when four-circuits on one side only were in use and would be $4 \times 5 = 60$ amp. For this the neutral should be a No. 4. In fact, this bank of circuits should be fed by three No. 4 wires and not by three No. 6, as the load on each circuit is given as 15 amp.

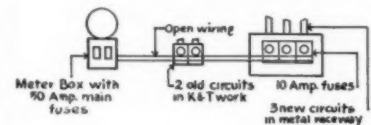
For three-circuits loaded to 15 amp. each and connected to a 3-wire single phase supply, the neutral should be a No. 8-wire as the unbalanced load will be 30 amp. when the two circuits on one side are in use.

For four such circuits the neutral should be No. 8, for five or six a No. 6 and for seven or eight, a No. 4 wire.

Where the load on each circuit is not 15 amp. but varies from 6 to 15 amp. per circuit we simply provide a neutral wire to the total load on the heavier loaded side of the 3-wire system.

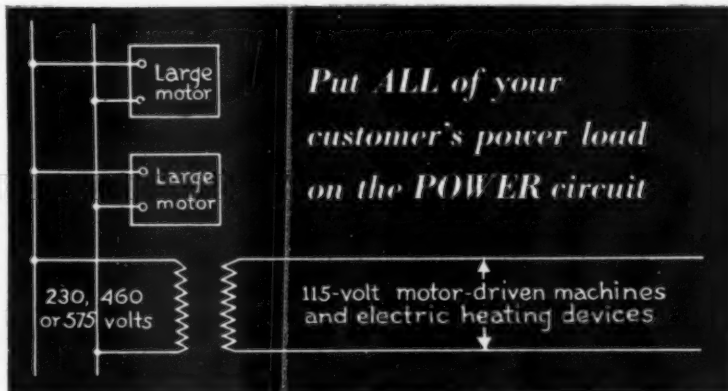
SIZE OF GROUNDING CONDUCTORS

Suppose I added three branch circuits in metal raceway to an old job that had two branch circuits as shown below, what size wire or pipe should be used to ground the metal raceways?



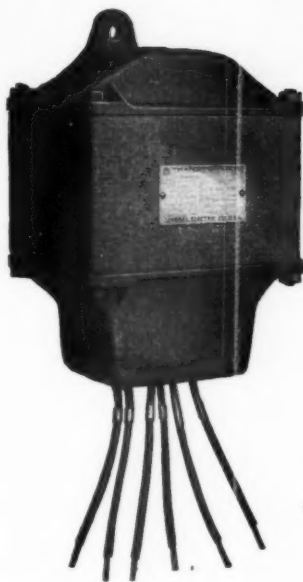
According to 907-n it states that the size of wire or pipe is governed by the size of fuse in circuit ahead of raceway. Would this mean the size fuse in the branch circuit, which is No. 10, or the size of fuse in the main switch, which is 50 amp?

The fuse referred to in rule 907-n is that immediately ahead of the circuit involved, which in this case is the 10 (or 15) amp. branch circuit fuse. The grounding conductor should therefore be a No. 14 wire or a 1/2-in. pipe.



*Put ALL of your
customer's power load
on the POWER circuit*

HERE'S PROFITABLE NEW BUSINESS FOR YOU



**It's small
Easily installed
Put it anywhere
No inspection
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HOW often small drills, compressors, vacuum cleaners, fans, soldering irons, glue pots, and similar shop appliances are connected to lighting loads!

This is not lighting load. By installing a small G-E air-cooled transformer for stepping down the voltage, these 115-volt devices can be operated from the power circuit. The saving in operating cost is considerable.

Now is the time to cash in on this new business. There are standard lines of G-E air-cooled transformers for many applications.

Your requirements for special voltage can be economically and quickly met from an extensive line of standard parts.

Write for our bulletin GEA-897D, which gives full descriptive and application data. Address General Electric, Dept. 6—201, Schenectady, N. Y., or call the nearest G-E sales office.



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TIME SWITCHES

440-41

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*The newest development
in electrical metallic tubing
that provides a ball-bearing
surface to facilitate wire pulling*

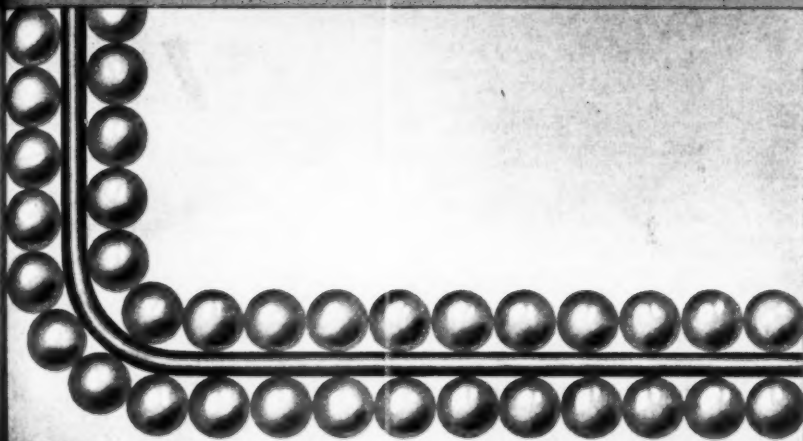


Electrunite Steeltubes Conduit with the knurled inside finish showed by actual test a saving of 30 per cent in the effort required to pull cable through. The cable rides the tops of the tiny knobs instead of making contact the entire length.

It isn't possible to line conduit with ball-bearings, but Steel and Tubes, Inc., has done the next best thing—has provided a conduit with a new inside finish (patent applied for) that gives very much the same effect. The inside surface of ELECTRUNITE STEELTUBES is no longer smooth. The flat metal strip, before it is formed and welded, is processed to give an inside surface that resembles ball-bearings—small round raised knobs on which the cable rides with 30% less surface friction. Pulling cable through ELECTRUNITE STEELTUBES requires less effort, less time and cuts down jams.

• But there are other advantages attending the use of this modern electrical metallic tubing that every

Steeltubes



contractor should know about. It is a rigid conduit designed to give full electrical and mechanical protection. It cuts and bends more easily than old-style conduit. It requires no threading—three simple fittings adapt it to any fitting and make perfect joints. And it has recently been accorded even more wide approval.

Try ELECTRUNITE STEELTUBES on your next job. Compare it with what you have been using and we'll leave the decision entirely in your hands. Or send for a sample length and full particulars on this modern electrical metallic tubing, and then draw your own conclusions.



Electrical Division
STEEL AND TUBES, INC.
 WORLD'S LARGEST PRODUCER OF ELECTRICALLY WELDED TUBING
CLEVELAND . . . OHIO
 A UNIT OF REPUBLIC STEEL CORPORATION

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Contractors Organized for Industry Welfare

INDUSTRY RELATIONS COMMITTEE

A special industry relations committee has been appointed by President Mayer to meet with joint committees of manufacturers and wholesalers to discuss more satisfactory relations between the electrical contractors and these other groups for the protection of the contractor with an adequate margin of profit through proper differentials. The committee is as follows:

H. B. Frazer, Philadelphia; John L. Flagg, New York City; John H. Busby, Detroit; J. R. Stolzenbach, Baltimore; Ralph Walker, Atlanta, and L. W. Davis, ex officio.

A joint meeting of the three groups was held in New York on February 21.

At a joint meeting of the manufacturers and wholesalers on January 25 it was the consensus of opinion that the contractor is entitled to recognition for services rendered in the distribution of electrical materials as follows:

"It was recommended that the manufacturers and wholesalers believe that on new work, the sale of electrical construction material should be made

to the ultimate consumer by the contractor.

"Insofar as industrial, commercial and institution buyers are concerned, the manufacturers and wholesalers believe that there are many industrial, commercial and institutional establishments that can be more economically and advantageously served by the electrical contractor and that the manufacturer and the wholesaler should quote prices to those classes of customers which will allow the contractor a reasonable margin of profit upon such business."

MEETING OF EXECUTIVE COMMITTEE CALLED

A meeting of the Executive Committee, N.E.C.A. has been called for March 3 and 4 in Washington to discuss N.E.C.A. code matters, appoint a Code Authority for the electrical construction industry and as one of the sponsoring bodies for the master code for the entire construction industry, appoint a member of its Code Authority, a member of the Planning and Adjustment Board and a member of the Appeal Board. The date was fixed to enable the committee to attend

General Johnson's meeting of all industry code authorities.

This will be the first full meeting of the committee since the Kansas City Convention in October, 1932.

NEW N.E.C.A. CHAPTERS

Electrical Contractors Association Youngstown District, Ohio, covering jurisdiction of Mahoning, Trumbull, Columbiana Counties in Ohio, and Ohio, Mercer and Lawrence Counties in Pennsylvania, to be known as Youngstown District Chapter. E. C. Carlson, 118 East Front Street, Youngstown, Ohio, President. P. M. Geary, Edison Building, Youngstown, Ohio, Manager.

Allegheny County Electrical Contractors Association Inc., covering jurisdiction of Allegheny, Beaver, Butler, Washington, Westmoreland, Armstrong and Fayette Counties in Pennsylvania to be known as Western Pennsylvania Chapter. Henry Reichle, 1414 Carson Street, Pittsburgh, Penn., President. R. C. Carmack, 405 Walsh Building, Pittsburgh, Penn., Secretary.

Electrical Contractors Association of Seattle covering jurisdiction of Seattle and King County, to be known as Seattle Chapter. J. J. Agutter, 316 Seneca Street, Seattle, Wash., President. F. Hackleman, 3326 White Building, Seattle, Wash., Secretary.

NEW MEMBERS

The following applicants have been accepted into the N.E.C.A. since the publication of the list in the February issue:

CALIFORNIA

San Francisco:

A & A Electric Co.
Oscar Abben Electric Works
Cooper Electric Co.
Dewey Electric Co.
Eureka Electric Radio Co.
Golden Gate Electric Co.
Fred Johnson Electric Co.
Kent Electric & Hardware Co.
Klinger Electric
The Light Shop
Edward J. Lynch Electric Co.
Lynn & Heffernan
P. & J. Electric Co.
Quality Electric Co.
Quayle Electric Works
Seabeach Electric Co.
Skeen Electric Works
Severin Electric Co.
R. H. Thompson Electric Co.
Fred D. Wilson Company

San Rafael:

W. K. Jennings, Jr.

Hazardous Locations

Need

APPLETON

Explosion-Proof Unilets



Type "CEST"
Explosion-
Proof Recep-
tacle Equip-
ment Com-
plete with
Type "CPH"
Plug

Companies of all kinds today realize the necessity of proper protection in hazardous locations. Lower insurance rates and the dangers to life and property are two of the important reasons.

Appleton Explosion-Proof Unilets meet the requirements of the Underwriters Laboratories for use in hazardous locations. They are made of malleable iron, give thorough protection, are sturdy, and the Cadmium Finish makes them rust resisting.

Bulletin 1003 contains valuable information on Hazardous Location Wiring. Write for Free Copy.

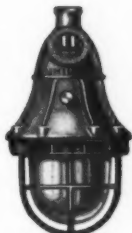
Sold through Jobbers

APPLETON ELECTRIC COMPANY
1749 Wellington Ave., Chicago, U.S.A.

New York—150 Varick St. Los Angeles—340 Azusa St.
San Francisco—655 Minna St.
St. Louis—420 Frisco Bldg. Detroit—7724 Woodward Ave.
Philadelphia—530 Arch St.



Type "GRUST" Unilet with
1/2" Union Hubs



Type "EVA"
Explosion-Proof
Lighting Fixture
(100 and 250-Watt)



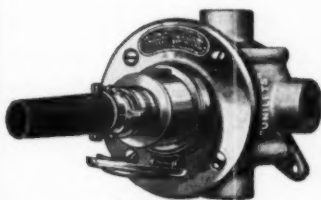
MDS Series Ex-
plosion-Proof Unilets



Type "HMSC" Ex-
plosion-Proof Motor
Starter
(Local Control)



Type "EVAR"
Explosion-Proof
Lighting Fixture
(300 and 500-Watt)



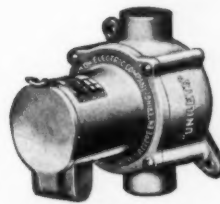
Type "CPSM"
Unilet complete with Lift
Cover and showing Type
"CPH" Plug inserted
in Receptacle



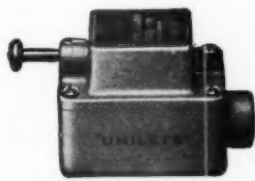
Type "GRUJ-2"
Unilet with Cover Removed
Showing Close-up Plugs
in certain Threaded
Openings



Type "C"
SW-7 Unilet with
Reciprocating Heater Switch



Type "CPSIC"
Unilet Complete with
Lift Cover (Closed)



Type "EFS" Unilet with
Tumbler Switch and Push-
Pull Rod



Union Connector



Type "EFS" Motor Con-
trol Push Button Station



Type "EGK"
Unilet with Interlocking
Type Safety Switch, Plug
Receptacle and Type
"EGK" Plug installed

APPLETON Explosion-Proof UNILETS

Reg. U. S. Pat. Off.

KEEP QUAD OUTDOOR AND INDUSTRIAL LIGHTING

foremost in your mind



Go after outdoor and industrial lighting now—Be sure to have the proper lighting equipment to sell—Team up with QUAD—

You have unbounded opportunities at present to cash-in on outdoor and industrial lighting sales—be sure it's QUAD you sell.

Hundreds of installations today are QUAD installations—They give effective lighting—they give the contractor a substantial profit.

Keep QUAD outdoor and industrial lighting equipment in mind when you're contacting your prospects. Ask for selling help—we'll gladly give it.

QUADRANGLE MANUFACTURING CO.

30 So. Peoria St. Chicago, Ill.



The new Type J Bracket has a 40 deg. vertical adjustment, 20 deg. up and 20 deg. down, and in addition, for the first time, a horizontal swing of 180 deg. without moving the bracket. It fully encloses the wire.

Here is the newest Quad unit, a porcelain enameled floodlight with two new and outstanding features that mean more business for you. (1) The aluminum plated projector delivers a longer, broader beam—without streaks or striations and (2) the aluminum wire-enclosing bracket puts the light just where you want it—with only one bolt to tighten.



Glasssteel Diffuser—a unit that is ideal for plant and office installations.

KENTUCKY

Alexandria:

Arthur L. Racke

Camp Taylor:

Raymond James Electric & Hardware Co.

Covington:

Geo. J. Hinnekamp

Ludlow:

Wm. L. Stottlebower

Newport:

George L. Carr

T. J. Gleason

Louisville:

A. A. Electric Co.

Althaus Bros., Inc.

Bowling Electric Co.

Kentucky Electric Rep. Co.

Link Electric Co.

Ochs Electric Co.

Olive-Muench Electric Co.

MASSACHUSETTS

Boston:

G and N Engineering Co.

NEW YORK

Buffalo:

Bettendorf Electric Co.

Lang Electric Co., Inc.

Uschold Electric Shop, Inc.

OHIO

Campbell:

Campbell Electric Co.

Cincinnati:

Bader Electric Co.

College Hill Electric & Radio Shop

Gem Electric Co.

John F. Eckel

Errett W. Edmonds

Chas. P. Fisher

Kerchner & Arbogast

P. W. Schath Electric Co.

Spangenberg's Electric Shop

Deer Park:

Frank H. Diesel

Niles:

The Rose & Rice Electric Co.

Struthers:

Kochis Electric Co.

Warren:

Cronberger Electric Co.

Hutton-Jones Electric Co., Inc.

Izant-Latimer Elec. Const. Co.

W. I. Lewis Electric Co.

Ruby Electric Co.

Youngstown:

Wm. H. Axelson

A. F. Beil Electric Company

The Berman Electric Co.

Franklin Wiring

General Wiring Company

Peterson Electric Company

Geo. A. Webster Electric Company

Whitstone Electric Company

PENNSYLVANIA

Greensburg:

Cavalier Electric Co.

Pittsburgh:

A. H. Schulte

Star Electric & Construction Co.

Stauffer Electric Co.

Scranton:

Eiden Electric Shop

WASHINGTON

Seattle:

C. B. Campbell Co., Inc.

O. A. Carlsen Electric Co.

Electrical Engineering Company

Fellstrom Electric Co.

G & C Electric Co.

F. Hackleman & Co.

Industrial Electric Co.

WISCONSIN

Milwaukee:

H. C. Adolphsen

These Fuses Protect both Your Motors and Payroll



Records show that two-thirds of the delays in starting motor-driven machines are occasioned by blown fuses. With the time-lag feature provided by Jefferson Super-Lag Renewable Fuses, temporary current surges do not blow the fuse. Payroll eating production delays are avoided and fewer fuse links are used. These savings pay for Jefferson Super-Lag Fuses over and over again. Order them today.

JEFFERSON ELECTRIC COMPANY
BELLWOOD... Suburb of Chicago... ILLINOIS

A NEW PRINCIPLE

The lag plate shown at the left is the secret of the Super-Lag Fuse. This lag plate delays the normal fuse action to provide a time interval or lag. This time-lag prevents the fuse from blowing during harmless temporary overloads. Motors and machines are not shut down needlessly—fuse links do not have to be replaced so often.

JEFFERSON

Super-Lag

RENEWABLE

FUSES

[B-107]

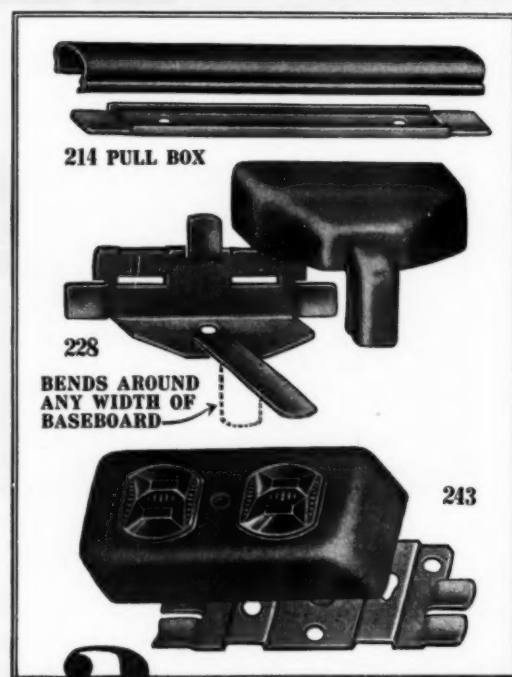
"Midget" WIREMOLD

Everybody says this "200" SERIES



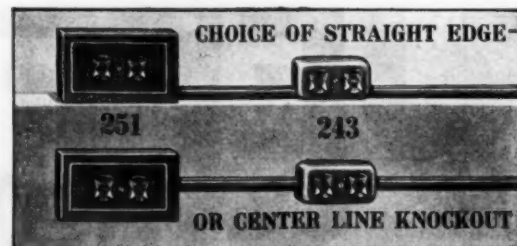
3 ELBOWS

Neat! Strong! No. 217 internal elbow has one adjustable leg scored in four $\frac{1}{2}$ -inch sections. You can break it off to fit!



3 BOXES

See double knockout on 243. Gives you choice of either straight edge or center line job — with a smooth, streamline effect!



Like all WIREMOLD products, No. 200 Series, the Midget Size WIREMOLD, is designed



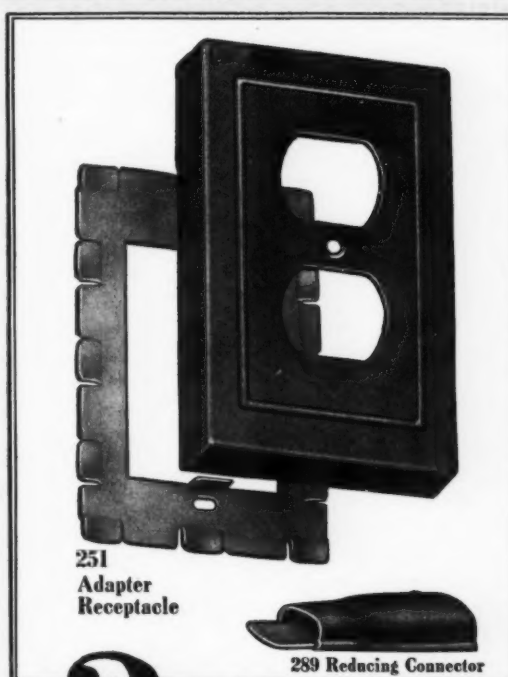
is a *"Honey!"*

makes a slick job! Easy to install — *and How!*



2 SUPPORTING FITTINGS

Invisible coupling and invisible clip!
Choice of two strong, rigid methods of concealed support. Clip may be located at any point!



2 STARTING FITTINGS

No. 251 provides a neat method of extending from any existing receptacle outlet. No. 289 connects with any WIREMOLD fitting having a 500 knockout!



with the needs of contractors first in mind — THE WIREMOLD COMPANY, Hartford, Conn.

CONTRACTING news

INFORMATION OF INTEREST TO ELECTRICAL CONTRACTORS
CONSISTING OF ITEMS OF NEWS, SHORT ARTICLES, PRACTICAL
IDEAS, ETC., OUR READERS ARE INVITED TO CONTRIBUTE TO
THIS DEPARTMENT

CONTRACTORS SECURE WORK- ING AGREEMENT WITH WHOLESALE

The Electrical Contractors' Association of the District of Columbia, which organization was formed in September, 1933, for the purpose of cooperating with the NRA, and bringing about a close cooperation of the electrical contractors in that section, has been successful in securing a working agreement with the wholesalers of the District of Columbia.

In addition, the association cooperated with the electrical department of the District of Columbia and the closed shop contractors' organization in drawing up a license law bill which is now in Congress.

There are over seventy members in the association and the officers are George A. Ford, president; L. L. Hayes, vice-president; Leslie C. Rucker, secretary, and W. E. Lawrence, treasurer.

CONTRACTORS SPONSOR LIGHT- ING SCHOOL

The Lehigh Valley Electrical Contractors' Association, 23 South Ninth St., Allentown, Pa., is sponsoring a school of lighting at its headquarters. Nationally known experts in lighting are engaged to conduct the sessions which are held weekly. The first two sessions were attended by about fifty members, and a number of architects and builders who had been invited.

The opening session of the school was conducted by Robert L. Zahour, illuminating engineer of the Westinghouse Lamp Co., and featured interior illumination. Through a series of lantern slides, Mr. Zahour showed

the proper and improper manner of illumination and explained the various ways in which it is possible to determine the proper amount of light for any purpose.

FLAME-RETARDING FINISH FOR ARMORED CABLE CONDUCTORS

Arrangements have been concluded whereby, beginning March 1, all conductors used in the manufacture of armored cable will have the special new finish called for in the 1933 edition of the National Electrical Code, according to a statement by A. R. Small, vice-president, Underwriters' Laboratories, New York City. "No armored cable fabricated after that date," Mr. Small continued, "will use individual conductors that are not 'covered for their entire length with a braid which is both flame-retarding and moisture-resisting.'"

A similar requirement with respect to N. E. Code Standard rubber-covered wires became effective in the Label Service work for that product on January 1.

"Because of the quiet situation in the building industry," the statement said, "large stocks remain in jobbers' and factories' stock of armored cable already manufactured that do not have the flame-retarding finish on the individual conductors. This material was manufactured and labeled in good faith and under ordinary conditions a large part of the stocks would have been consumed in installation work. In view of advices from the manufacturers' representatives in Underwriters' Industry Conference for Armored Cables and Cords, the laboratories recommend that all such existing stocks be accepted for use in installations until exhausted."

MINNESOTA CONTRACTORS HOLD RECORD MEETING

With the largest attendance ever held at a meeting of electrical contractors within the state the Minnesota Electrical Association held its sixth annual convention together with the first annual convention of the Minnesota Electrical Council at Faribault, Minn., on February 22 and 23. Nearly 200 were registered from different branches of the industry.

The first day was given over to an open meeting for discussion of general policies and industry programs and the second day was devoted entirely to detailed operations and plans of the two organizations.

L. H. Gordon of the Gordon Elec-



L. H. Gordon, President-Elect

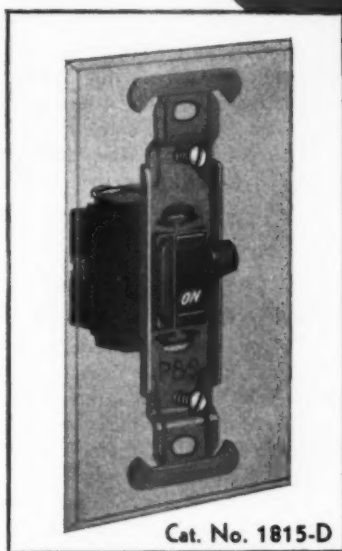
tric Co., Albert Lea, was elected president of the Minnesota Electrical Association, succeeding Charles W. Turner of Faribault. The other newly elected officers are John Ellenbecker, St. Cloud, vice-president; W. A. Ritt, secretary-treasurer, with the following as members of the board of directors: E. G. Nylund, Duluth; Charles Wood, Fargo, N. D.; A. J. Naylor, Bemidji; Ray Mrachek, Rochester; J. W. Hruska, Mankato; Arthur Thompson, Cloquet, and C. W. Turner, Faribault.

At the opening session reports were made by Frank T. Langford, president of the Council and W. A. Ritt, who is secretary of both organizations, indicating the progress that had been made in state association

CONSTANTLY ADVANCING



Cat. No. 1311



Cat. No. 1815-D

FOR REPLACEMENT

Under EXISTING tumbler switch plates—Strap permanently attached—same efficient arc-snuffing mechanism as Catalog No. 1311. A real all purpose switch for any type installation.

The P&S-DESPARD LINE of TYPE "C" SWITCHES

● Although P&S Despard Switches, since introduced a year and a half ago, have gained widespread acceptance by the foremost Architects, Engineers and Specification Writers, in the country—we have not been resting on our laurels.

● Our Engineering and Research Departments have been constantly experimenting, constantly searching for "the ultimate in switch design."

● It is, therefore, with pardonable pride that we are pointing out a few important features—all of which are found only in P&S Despard switches.

● And most important is the fact that P&S Despard Type C Specification switches—cost no more—than ordinary porcelain cup switches.

PASS AND SEYMOUR, Inc.

Solvay Station

Syracuse, N. Y.

GREENLEE TOOLS

Pay For Themselves On The First Job

SO many users have told us that Greenlee Conduit Benders and Knockout Tools pay for themselves on the first job, that we have made this statement here without reservation. Of course, we know it isn't true in the case of a very small job, but it does hold good on one of reasonable size.

But the exact point at which savings equal the cost of the tool is of small importance. The thing that really counts is that Greenlee Tools do cut the cost on operations for which they are intended, by doing them quicker and better, and by making it easier to perform later operations.

Take the Hydraulic Benders for example. They make better bends in less time and with less effort; they eliminate many costly fittings; and they make it easier to pull in wire and cable. And last, but not least, they are easy to take to the job.

Companion tools of the Benders are the Greenlee Knockout Punches and Cutters. When it comes to enlarging knockouts for conduit, there is no better way of saving time and doing an accurate, smooth job than by using these tools. They eliminate all reaming and filing and are convenient to operate.

Other GREENLEE Tools

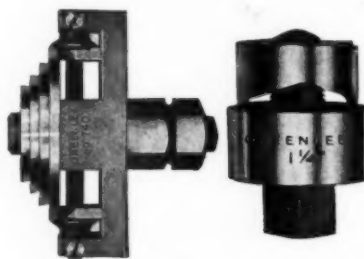
Hydraulic Pipe Pushers
Joist Borers Bit Extensions
Electrician Bits



Above is shown the No. 770 Hydraulic Bender with a piece of rigid conduit being bent. It handles all sizes from 1½ to 3-inch. The No. 775 will bend all sizes from 2½ to 4½-inch. They are simple to operate and are easily portable.



Greenlee Hydraulic Bender with attachments for bending thin-wall steel conduit. Bends 1½, 1½ and 2-inch sizes, easily, quickly, and without crushing.



Greenlee Knockout Tools

Used for enlarging holes in cabinets, panel boards, etc. Leave clean, round holes. No filing or reaming. Punches make enlargements for ½ to 2-inch conduit. Cutter makes enlargements for 1½ to 3-inch conduit.

GREENLEE TOOL CO., Rockford, Illinois

-----Mail This Coupon Today-----

GREENLEE TOOL CO., ROCKFORD, ILL.

Please send complete information on Greenlee Conduit Benders and Knockout Tools.

Name

Address

City State

My Jobber is..... 3-24

work during the year and some of the problems ahead of them.

Following these reports addresses were made by the following:

S. B. Williams, general manager, ELECTRICAL CONTRACTING, Chicago, on "The Electrical Contractor and The New Deal under NRA Codes"; T. L. Losby, promotional sales manager, Northern States Power Company, Minneapolis, "The Value of Cooperation in the Electrical Industry"; W. T. Clark, Incandescent Lamp Department, General Electric Company, Nela Park, Cleveland, "A New Approach to Lighting Sales: Lighting for Seeing"; D. E. Ford, president, North Central Electric Wholesale Association, "Code Relations Between Manufacturers, Wholesalers and Contractor-Dealers," and William T. Foley, service editor of *The Farmer and Farm Stock and Home*, "What the Agriculture Recovery Administration Means to Northwest Business."

At the closed sessions most of the time was given over to a discussion of NRA codes which might affect the business of the electrical contractor and dealer.

George P. Svendsen of Boustead Electric Co., Minneapolis, briefly outlined some overhead and management problems in the electric motor repair business, pointing out where losses might occur.

A method of unit prices for materials installed as a basis for billing and estimating on small jobs was explained by Foster Poole of the Industrial Electric Co., Minneapolis. It was voted to continue the study of this subject and develop it in more detail.

INDEPENDENTS' 1934 OFFICERS

The 1934 officers of the Independent Electrical Contractors' Association, Inc., New York City, are as follows: H. Marshall Smith, president; H. M. Walter, 1st vice-president; H. L. Langer, 2nd vice-president; John J. Bauer, treasurer; Nathan Zolinsky, financial secretary; N. D. Lyons, recording secretary, and John Wilhelm, sergeant-at-arms.

The directors are A. Lincoln Bush, chairman; H. Marshall Smith, H. M. Walter, H. L. Langer, John J. Bauer, Nathan Zolinsky, N. D. Lyons, John Wilhelm, L. C. MacNutt, Louis Freund, Alfred Whitely,

YOU'D BET
the Sun would rise
tomorrow —

SANGAMO

TIME-SWITCHES

Depend on
SANGAMO
for these 16
Time-Switch
Markets:

1. Oil burner control
2. Ice machine defrosting
3. Apartment house lighting control
4. Beacon lighting control
5. Floodlighting control
6. Airport lighting control
7. Traffic lighting control
8. Billboard lighting control
9. Electric sign control
10. Ventilation control
11. Display window lighting control
12. Poultry house lighting control
13. Blower operation control
14. Automatic stoker control
15. Motor control
16. Oil filter control

are as dependable

You can rest assured that Sangamo Time-Switches will operate accurately in any kind of weather on any job. Sangamos are built that way—only the best of the highest quality materials — assembled by the expert workmen of Sangamo with more than 30 years of precision instrument manufacturing to back them up. Dependability is one of the many things you get in the complete line of Sangamo Time-Switches—

In addition you can keep your sales profits because—

Maintenance Cost Cut to a **MINIMUM**

When Sangamo Time-Switches were designed, future maintenance was given careful consideration — Sangamos are built to entail a minimum of maintenance —that's why your profits are longer with Sangamos. Try Sangamos on your next time-switch job — You'll like them — so will your customers.

SANGAMO ELECTRIC COMPANY • SPRINGFIELD, ILLINOIS

NUMBER ONE OF A SERIES OF ADVERTISEMENTS

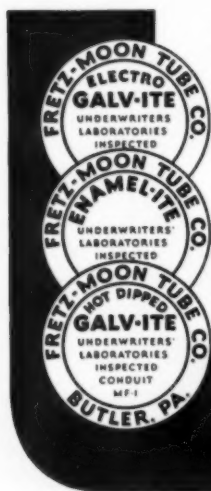


Why FRETZ-MOON CONDUIT is the **BETTER** rigid steel conduit

Electrical contractors who have read Fretz-Moon advertising are familiar with some of the reasons why Fretz-Moon Rigid Steel Conduit offers so many advantages. Contractors who have used it know what these advantages mean in better electrical construction and dollars and cents value.

To fully acquaint contractors who seek the most for the money—who are not now using Fretz-Moon Conduit—we present this advertisement as the first of a series which will tell the complete story of the unique process by which Fretz-Moon Conduit is made, and how the "continuous process" of manufacture produces a better conduit—a conduit that meets all requirements and code specifications; is perfectly threaded, easy to cut, bend and thread, hence easier to install; saves money; and lasts for the life of the structure in which it is used.

Watch for the second of this series which will appear next month in this publication. In the meantime, you can prove to yourself the value of standardizing on Fretz-Moon Conduit by using it on your next job. Demand it from your wholesaler. If he doesn't stock it, write us.



STEEL AND TUBES, INC.
CLEVELAND • OHIO
EXCLUSIVE SALES AGENTS

FRETZ-MOON

**Rigid
conduit**

Albert A. A. Tuna, Irving Gaynor, S. J. O'Brien, Harry A. Hanft and Fred B. Zenker.

REELECT OFFICERS OF QUAD CITIES CHAPTER

The following officers were re-elected to serve during 1934 by the members of the Quad Cities Chapter, N.E.C.A. Davenport, Iowa.

G. A. Chaudoin, president; L. W. Zeug, vice-president; P. A. Schlueter, secretary, and R. D. Speers, treasurer.

Following the election President Chaudoin appointed the following standing committees for the ensuing year: Labor relations, H. M. Hey-singer, chairman; F. B. Leithner, C. O. Hammerquist, and W. J. Mc-Nealy, alternate. Jobbers relations, R. D. Speers, chairman; W. J. Mc-Nealy and L. W. Zeug.

The members meet regularly every week with an average attendance of 75 to 90 per cent.

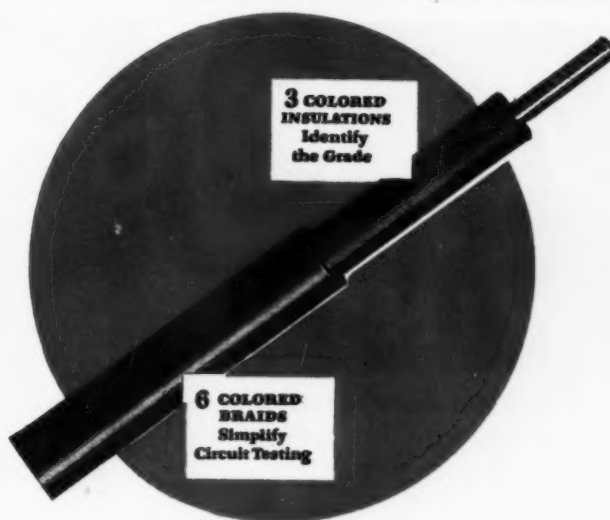
One of the major activities of the association is the development of jobber's relations and sales policies.

SAN FRANCISCO CONTRACTORS FORM ASSOCIATION

San Francisco Electrical Contractors Association, Inc., a section now of the Northern California Chapter, N. E. C. A., with a separate set of officers and committees, is the outgrowth of the development of the San Francisco group during the past year. Incorporated as an association, the autonomy is provided so that the affairs of the San Francisco group will not interfere with those of the chapter in the local administration of



C. A. Langlais (left) and Ken Ryals, president and secretary of new association.



G-E IS SAFE- Easy To Install

Every coil of G-E Code Wire is tested before you get it — it has Underwriters' Approval — it has flame-retarding finish.

You save money by using G-E Code Wire. It's easy to install. Conductors are uniform in size — the maximum number of wires can be pulled in a conduit. Its smooth, tough finish makes wire pulling easy. 3 colored insulations identify the grade. 6 colored braids simplify circuit testing. G-E Code wire is available always for immediate delivery from your nearest G-E Merchandise Distributor. For information, write Section DW-193, Merchandise Department, General Electric Company, Bridgeport, Conn.

CODE WIRES

USE G-E Switches and Plates

All G-E Switches, flush and surface types, are strong and durable. Their lasting qualities assure long life and efficient performance.

G-E Flush Tumbler Switches are available in porcelain boxes or totally enclosed in compound boxes. All flush switches are equipped with wide mounting ears.

G-E Textolite Flush Plates add beauty and harmony to a home or office. They are attractive and hold their color. Brown or black stippled finish.

Use G-E Switches and Plates. They are rugged, dependable and give long service. Your G-E Merchandise Distributor can supply you. Or write to Section DW-193, Merchandise Department, General Electric Company, Bridgeport, Conn.

WIRING DEVICES

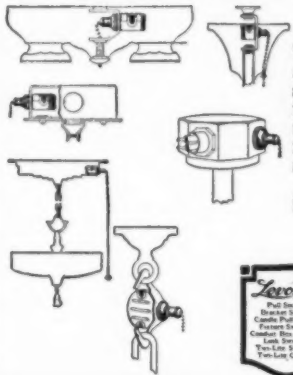
GENERAL ELECTRIC

MERCHANDISE DEPARTMENT, GENERAL ELECTRIC COMPANY, BRIDGEPORT, CONNECTICUT

Levolier

THIN MODEL WINS!

—where Service and Adaptability Count



The Levolver Thin model Switch No. 41 is an achievement in small switches. The above actual size picture shows it is less than $\frac{1}{2}$ of an inch in thickness. . . In spite of its smallness, it retains all of the practical characteristics of the famous Levolver line. It is the smallest 6 amp. switch made.

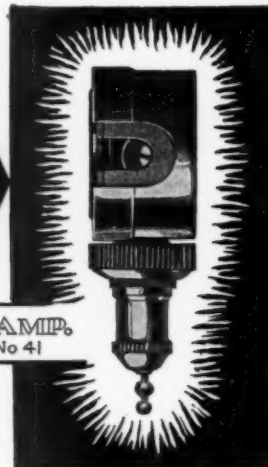
At the left are shown six logical uses for this practical Levolver, which may be secured in three different stem lengths.

You'll make no mistake in ordering these Levolver Thin Model Switches



McGILL
MANUFACTURING CO.
Electrical Specialties of Quality
ESTABLISHED 1904
VALPARAISO - INDIANA
Box No. 676

6 AMP.
No. 41



the code when finally approved. Charles A. Langlais was elected president for 1934.

The executive committee of the San Francisco association was enlarged to include representatives from the "knob and tube club," and new responsibilities given each member. Each executive committeeman becomes a district or group representative for a certain number of members, who take up their problems and difficulties with him rather than the officers in order to relieve the latter from a tremendous amount of work to the detriment of their own businesses. The association employs no manager, hence all of such responsibilities are placed upon the officers, and this means is taken to spread them among the entire official family.

Named on the executive committee, beside the president, C. A. Langlais, Vice-President Lloyd Flatland, and Secretary Ken Ryals, are C. B. Kenney, NePage-McKenny Co.; Charles Shipman, Atlas Electrical and Engineering Co.; Bert J. Doherty; George Draeger; Tom Harris, H. S. Tittle Co.; and Victor Lemoge.

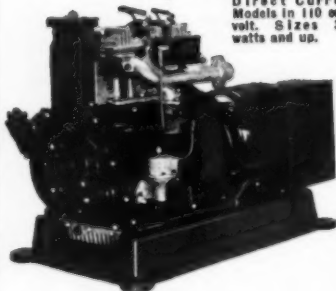
A. C. ELECTRIC GENERATING PLANTS

The Sale of
MODERN
A. C. PLANTS
brings calls for
WIRING,
FIXTURES,
APPLIANCES,
and
EQUIPMENT

ONAN ALTERNATING CURRENT PLANTS operate on Gasoline, Gas or Distillate. COMPLETE, READY to RUN. Built in sizes 300 to 50,000 watts. Supply 110 or 220 volt, 60 cycle, single or three phase current. For use where power lines are not available, for standby equipment. Public Address and Sound Car Installations.

Operate A. C. Radio Washing Machines, Water-Pumps, Refrigerators, Motors, or any equipment operated from city current can be run on ONAN A. C. PLANTS.

D. C. Models as Low as \$99.00 Direct Current Models in 110 or 32 volt. Sizes 300 watts and up.



Write for Details

D. W. ONAN & SONS

286 ROYALSTON AVE., MINNEAPOLIS, MINN.

SHERMAN TERMINALS

Sherman makes a line of terminals suitable for all practical purposes but new styles are being constantly added as demand requires.



Brass Ring Terminal
No. 54



Roll Type No. 40



No. 8

Sheet Metal Without Bridge

Order from your Jobber

The Sherman Terminals are made to the highest electrical efficiency consistent with low cost. If you have need for special terminals send us your requirements.

H. B. SHERMAN MFG. CO.
BATTLE CREEK MICHIGAN

HONEGGER REELECTED PRESIDENT OF DES MOINES ASSOCIATION

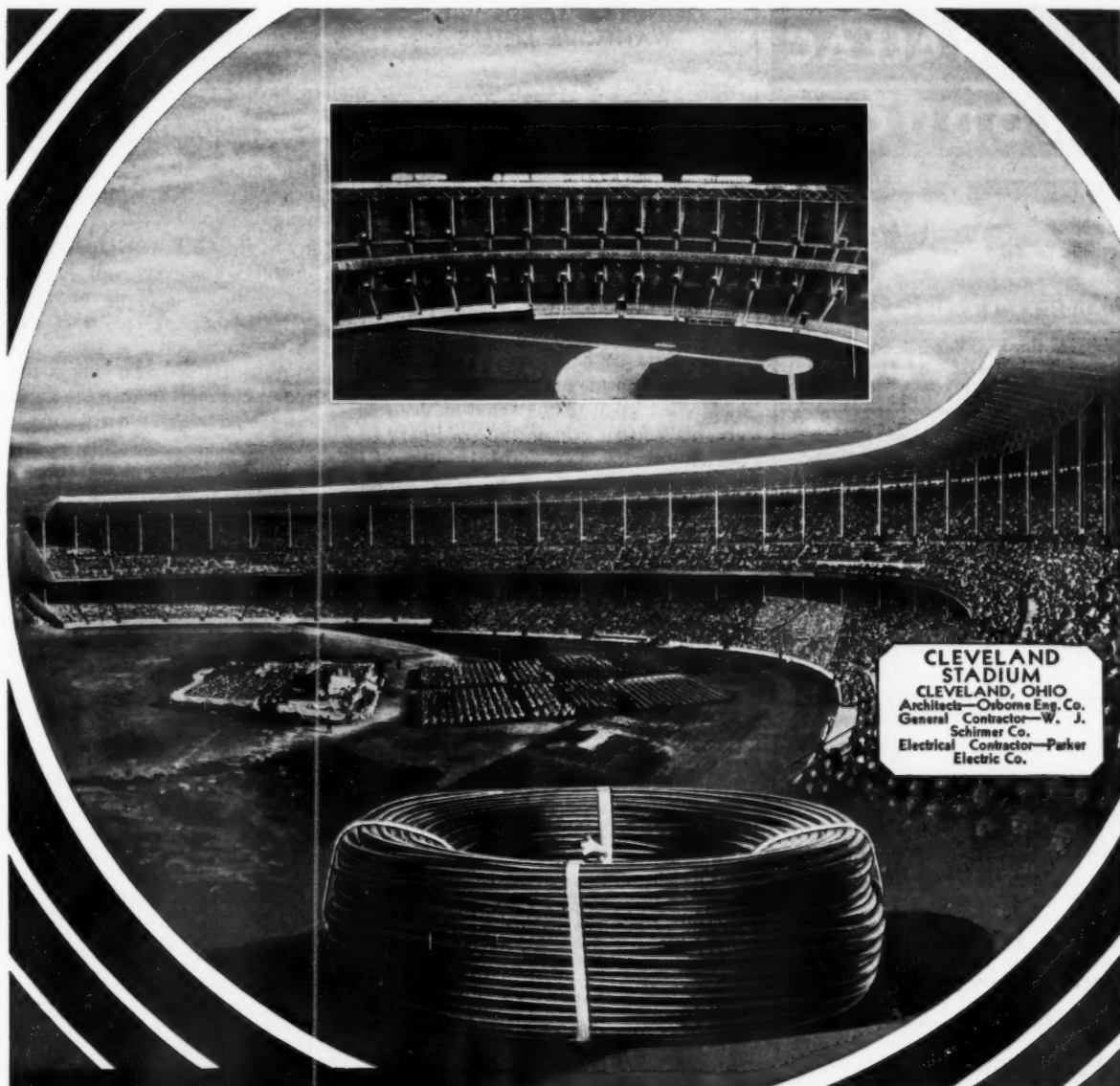
On February 15 the Des Moines (Iowa) Chapter of N.E.C.A. re-elected R. Honegger, president. Other officers elected were Harry Biermann, vice-president, and John Hansen, secretary-treasurer.

At the present time the association is working on a very definite program to widen the cooperation of electrical service to the public, and carrying on a "Good Will Program".

The members of the association are also planning to make periodical visits to other cities in order to make contact with other electrical contractors.

ESTIMATORS ELECT OFFICERS

Estimators of Los Angeles, the oldest organization among contractors in the region elected the following officers for 1934: Victor Sayre, president; Robert Booth, vice-president, Edward Reynolds, secretary, and R. A. Crosby, treasurer. The new executive board is composed of P. N. Mactolf, L. H. Ellett, M. C. Williams, and Harry H. Hamm, the retiring president.



CLEVELAND STADIUM
CLEVELAND, OHIO
 Architects—Osborne Eng. Co.
 General Contractor—W. J. Schirmer Co.
 Electrical Contractor—Parker Electric Co.

AMERITE 30% RUBBER COVERED WIRES

Floodlighted — For Swift Play

Architects and engineers recognize that *modern lighting* demands *modern wiring*. In the Cleveland Stadium, floodlights strategically located give practically daylight brilliancy to every section of this great athletic field.

Amerite Rubber Covered Wires and Cables serve a vital part in this unique lighting system. They have been used exclusively for distribution of the entire electrical load.

Amerite is a 30% "Performance Test" Rubber Compound which possesses, in addition to inherently high electrical qualities, unusual "Aging" Properties and Resistance to water absorption. It is the choice of the country's leading architects, engineers and contractors. Specifications will be furnished on request.

1831



1934

AMERICAN STEEL & WIRE COMPANY

208 South La Salle Street, Chicago
 94 Grove Street, Worcester

SUBSIDIARY OF UNITED STATES STEEL CORPORATION

AND ALL PRINCIPAL CITIES

Empire State Building, New York
 First National Bank Building, Baltimore

Pacific Coast Distributors: Columbia Steel Company, Russ Bldg., San Francisco

Export Distributors: United States Steel Products Company, New York

MINERALLAC PRODUCTS



HANGERS FOR CABLES & CONDUITS

Easily the best for quick, low-cost installation work. Send for full details and costs.

1 Hanger without Porcelain Bushing. Spring steel; stronger, quicker, more compactly arranged.

2 Hanger attached to steel beam with bolt and nut.

3 Jiffy Clip—quicker, neater work at less cost.

4 Cable Joint or Pot-head Compound—8 grades for every system, underground or overhead.



JIFFY CLIPS



Insulating Compounds

MINERALLAC ELECTRIC CO.
25 North Peoria Street, Chicago, Ill.



Your fellow merchants
are your customers

with
**OHIO
BRUSH**
Kit No. 35



Motors on coffee grinders, meat choppers, shoe repair machines and many other types of equipment can be quickly "brush serviced" from Ohio Kit No. 35.

Contains 128 brushes for over 300 different types of single phase motors—all popular numbers in every day use.

Send coupon for complete catalog and prices.

OHIO CARBON CO.
12504 BERE A RD.,
CLEVELAND, OHIO

NAME

ADDRESS

CITY STATE

MEASURING LOADS WITH WATTHOUR METERS

Editor,

ELECTRICAL CONTRACTING:

The article in the February issue by Mr. E. M. McLaughlin on "Measuring Loads with Watthour Meters" is of considerable interest to me inasmuch as I have advocated, for a number of years, the practice of not only using a watthour meter for determining electrical consumer loads but also for determining energy input to various devices on which efficiency tests are being run. The modern watthour meter can be adjusted and relied upon to the same or even greater extent than the ordinary portable watt meter, and in addition, automatically averages the effect of voltage variations.

It seems to me that possibly additional information should have been contained at the end of Mr. McLaughlin's article where he listed the basic watthour constants for various makes of meters. During approximately the last four years the basic watthour constants of Westinghouse, Duncan and Sangamo watthour meters have been $\frac{1}{3}$ watthour per revolution of the disc, and the G. E. meters have had a basic constant of 0.6 watthour per revolution. The

type letter on the meter will indicate whether it is a late or early model. The types of the various makes of meters having the more recent constants are as follows:

G. E. Type I-16.

Westinghouse, all types.

Duncan, Type MB.

Sangamo, Type HC.

Many of the G. E. polyphase watthour meters, however, still have a constant of 0.3 watthour per disc revolution when referred to a single phase meter. That is, the actual watthour constant of a 5-ampere, 110 volt, 2-element polyphase, G. E. watthour meter may be 0.6 watthour per revolution or 1.2 watthours per revolution, depending on whether or not it is to be used with or without instrument transformers. The polyphase meter having the 0.6 constant is rated by the manufacturer as a 2.5 ampere meter.

An inspection of a meter will generally reveal that its watthour or wattsecond constant is painted on the disc, or is indicated on the nameplate.

ROYCE E. JOHNSON, Director,
Electrical Standards Laboratory,
University of Wisconsin.
Madison, Wis.



OAKLAND ORGANIZES FOR CODE: Oakland, Calif., contractors, for some years meeting as an informal small association, decided last month to start reorganization and enlargement of their organization to prepare for operation under the forthcoming NRA code. Offices were established at the Builder's Exchange, and George Eldridge, former field secretary for the California Electragists, was appointed executive secretary of the organization, which now embraces all of Alameda county. Known as the Electrical Contractors Association of Alameda County, the organization plans affiliation with N.E.C.A. shortly. Frank E. Boyd, Pacific Electric Motor Co., Oakland, is president of the association; William Bernhardt, Bradshaw Electric Co., Berkeley, vice-president; Dan Bronson, California Electric Co., Ltd., secretary, and T. L. Rosenberg treasurer. Seated: Wm. Bernhardt (left) and Frank Boyd. Standing, left to right: George Eldridge, Dan Bronson and T. L. Rosenberg.

Explosion-Proof Condulets For Hazardous Locations



Secondary Breaker Condulet



General Use Switch Condulet



Circuit Breaker Condulet

The Secondary Breaker Condulet is designed for secondary breakers for fractional horsepower motors, or for lights, heaters, or other small electrical appliances.

The General Use Switch Condulets are furnished complete with positive quick make and break non-fusible tumbler switches, either single or double throw.

Circuit Breaker Condulets are designed for "Flipon" and type AB-I "De-ion" Circuit Breakers, which are suitable for service entrance, feeder, or short-circuit protection; for lighting, appliance, and motor circuits, and require no additional protection—such as fuses.

Motor Starting Switch Condulets are designed for the various "across-the-line" starting type switches with thermal overload trip.

Catalog sent upon request.



Motor Starting
Switch Condulets



CH 581

CROUSE-HINDS COMPANY

SYRACUSE, N. Y., U. S. A.



DEALERS WANTED!

Every Range Owner in Your Town Is
Worth Up to \$15 Quick Profit for You!

Do you want to make some money easily? Do you want to line up repeat business? Do you want to increase your weekly sales? You are the dealer we want. If you are willing to call on range owners, show them an item they want to buy and NEED—then you are in for some extra profits. No selling necessary. Just call on electric range users, show them the NEW Chromalox Super-Speed REPLACEMENT TOP BURNER. Let them use it and try it for a few days. Demonstration of increased cooking speed gets orders 8 out of 10 times.

Sounds too good to be true, but hundreds of dealers are making money speeding up old ranges with Chromalox. Easily installed—only screw-driver and pliers needed! No large investment involved. A few stock sizes fit all makes of electric ranges, regardless of model.

Here's Proof



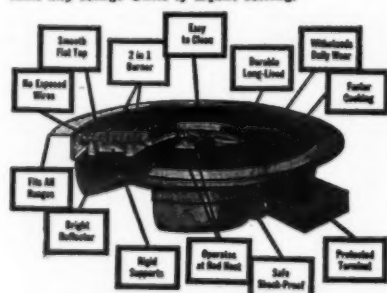
Alex Bear, Richmond, Va., electrical contractor has sold 165 Chromalox range units—made over \$560.00 profit.



Correll Electric has practically Chromalox-equipped every range in Linton, Indiana—resold customers on electric cookery.

J. E. Heaps of Altoona, Pa. has made over \$500.00 speeding up old ranges with Chromalox. Demonstration quickly gets orders.

By TEST...Faster, More Efficient and Longer Live than any Range Units of Equal Rating!



MAIL COUPON FOR FULL DETAILS

WITH YOUR BUSINESS LETTERHEAD TODAY!

EDWIN L. WIEGAND CO.

Manufacturers of Chromalox Heating Units
7585 Thomas Blvd., Pittsburgh, Pa.

Without obligation, send us complete data about Chromalox Super-Speed Replacement Range Units and how we can make money selling them. There are approx. elec. ranges in the territory we serve. Check which () We sell elec. ranges () We do not sell elec. ranges. () Send us catalogs about Chromalox-equipped electric ranges.

Signed..... Position.....

NEWS MANUFACTURERS

A DEPARTMENT FOR THE ANNOUNCEMENT OF ACTIVITIES OF MANUFACTURERS THAT ARE OF INTEREST TO CONTRACTORS, SUCH AS CHANGES IN EXECUTIVE PERSONNEL, BRANCH OFFICES, NEW PRODUCTS, ETC.

TRUMBULL CONDENSES CATALOG FOR QUICK REFERENCE

Giving comparative listings in tabular form the new Trumbull Ready Reference Catalog (16-A) represents many months of study and planning to produce a catalog which would lessen materially the time spent by purchasers in looking up information.

The material has been arranged in tabular form to make it easy for one to compare prices and features of the different items that might be used. It also is designed to give the purchaser at a glance a complete picture and price range of all available items.

The Trumbull company also states that this plan of listing will more easily enable them to issue reprints as changes necessitate.

The tabular listings in the new condensed catalog are grouped as follows: (1) Safety Switches, (2) Starters, (3) Meter Service, Entrance and Combination Range Switches, (4) Open-Knife Switches, (5) Industrial Circuit Breakers, and (6) Panelboards.

THOMAS G. GRIER

Thomas Graham Grier, prominent in electrical circles, died at Phoenix, Arizona, on February 16 in his sixty-ninth year, after an illness due to a heart affection. He withdrew from active business several years ago and for the past two years had been in failing health.

"Tom" Grier, as he was affectionately called, first became connected with the electrical industry through his association with the Marr Construction Company in 1887. At that time there were practically no electric light plants in the United States and



Thomas G. Grier

he was one of the pioneers in making central station installations. He later became western manager of the Bryant Electric Company, afterward assuming charge of the western territory for Harvey Hubbell. Also, at one time was active in promoting the sales of the H. T. Paiste Company, and was thus very closely identified with the wiring device business for over forty years. Besides these connections, he was advertising manager for the Western Electric Company and had held successively the selling agencies of the American Circular Loom Co., Nunnegesser Carbon & Pottery Co., Condit Circuit Breaker Co., Chase, Shawmut Co., and others.

In addition to his commercial activity he was an able writer on engineering subjects, as well as finding time to gratify his desire for travel here and abroad.

He is survived by his widow, Mrs. Susie Clark Grier of Chicago, a sister, Mrs. Margaret G. Russ of Hart-



.....THE FUSE CHECK BOOK

If you believe in *creating* business . . . in going after profitable wiring jobs on the basis of saving money for your customers . . . you'll be interested in Westinghouse Nofuze Industrial Circuit Breakers and the Fuse Check Book that helps you sell them.

The Nofuze Breaker not only eliminates the cost of fuse replacement, but also the loss of valuable time by men and machines every time a fuse blows. Accurate records show that these costs reach surprising amounts in the average

industrial plant—often, enough to pay for a complete Nofuze installation in a short time.

With the Fuse Check Book, a plant manager can keep an accurate check on what he's paying for fuse replacement and time lost by men and machines. Get *your* prospects to check their fuse costs and you've gone far toward landing profitable wiring jobs with Nofuze Breakers.

Just mail the coupon for a supply of Fuse Check Books and complete selling information.



Westinghouse
Nofuze Circuit Breakers

SEND FOR CHECK BOOKS

Westinghouse Electric & Manufacturing Company
Room 2-N East Pittsburgh, Pa.

Gentlemen: Send me a supply of Fuse Check Books and complete selling information on Nofuze Circuit Breakers.

Name.....

Company.....

Address..... T 79919

City.....State.....EC 3-34

March New Products

Flexible Conduit Fitting

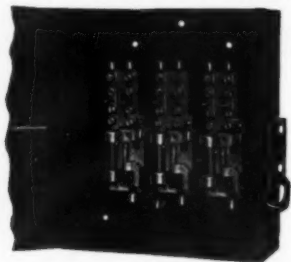
Pyle-O-Flex, a watertight, vaportight flexible explosion-proof conduit fitting is announced by The Pyle-National Co., Chicago, Ill. Fitting is adapted to the wiring of gasoline pump and explosion-



proof motors in filling stations, bulk gasoline stations, refineries and for use in grain elevators. It is also adapted to watertight installations on ships, docks and other exposed locations, for breweries, distilleries, chemical plants, dry cleaning plants, swimming pools and similar locations. Flexibility of fitting eliminates bending and fitting of rigid conduit in limited spaces. Pyle-O-Flex withstands vibration and manufacturer claims it is not only capable of withstanding 500 lbs. hydrostatic pressure, but each fitting is tested against leaks under water at 50 lbs. air pressure.

Switches

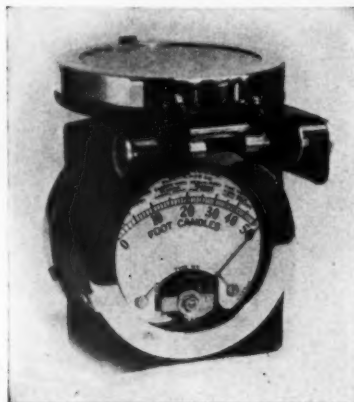
The addition of a line of meter service switches and main entrance switches of the accessible fuse type is announced by Bull Dog Electric Products Co., Detroit,



Mich. Capacities range from 30 to 600 amp., 125-250 volt. The addition of this line will augment the industrial line of switches now being manufactured by the company.

Meter

A Right Light meter for measuring light intensities and making illumination surveys is announced by Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. Manufacturer states that only a few seconds are needed to check lighting conditions at any point since dial is marked in foot candles with zones denoting minimum amount of light needed for specific types of work. Unit uses Westinghouse Photox cell which changes light directly to electric current without any auxiliary electrical supply. Photox cell and microammeter which measures cell current are mounted together in a moulded case, and cell is hinged, protecting it against breakage and protecting instrument dial and cell when unit is not in use. Meter has a scale length of 1.8 in. and is divided into 50 divisions. Cell consists of a disc of



copper oxide on copper with a hinged cover arrangement in which cell is mounted. Complete unit is of a convenient size so that it may be held in the hand and directed to various parts of the room, obtaining readings of intensities from all directions, which is accomplished by rotating the hinged cell to a position opposite observer and pointing it in the desired direction.



Dome Reflector

Bright Light Reflector Co., 100 White St., Brooklyn, N. Y., has added No. 2514 PH dome reflector with pendant hood and socket to its line of "Silv-A-King" commercial and industrial reflectors. Unit is designed for use with 150-watt lamps and has a 14 in. diameter. Reflector can be furnished with auxiliary reflectors of satin-finish aluminum at no additional cost. Auxiliary reflector fits closely around the neck of lamp, thereby utilizing light output which would ordinarily be lost in the neck of reflector.

Motor Starter

The Industrial Controller Division, Square D Co., Milwaukee, Wis., is manufacturing a solenoid type of auto-



matic electric motor starter, designated Class 8532 type F and has maximum polyphase ratings of 5 hp. 220 volts; 7½ hp. 440-550 volts. Contactor has a vertical, straight line, solenoid action and manufacturer claims it cannot be accidentally closed by vibration. Thermal overload relays are mounted on front of panel and are interchangeable. Contacts are silver, double break. Insulating base and arc barriers are porcelain. Extra wiring space is provided in cabinet and push buttons on cover are 1 in. diameter. Unit is also built with 4 pole contactor for 2 phase service.

Drills

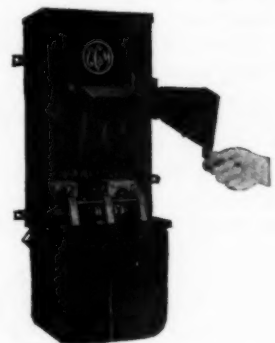
Armstrong Bros. Tool Co., Chicago, Ill., has added star drills to its line of tools. These drills are drop forged from special high carbon chisel steel, hardened and tempered. They are finished



in black baked enamel and edges are ground bright. Shanks are of proper stiffness to prevent bending. Drills are made in 8, 12, 18 and 24 in. lengths, in diameters from ¼ to 1 in. by sixteenth inches; large diameters from 1 to 1½ in. come by eighths in the 12, 18 and 24 in. lengths. They are of the 4 point type.

Magnetic Starter

The Electric Controller & Mfg. Co., Cleveland, Ohio, has just placed on the market the EC&M No. 2 type ZOS oil-immersed across-the-line, combination magnetic starter for motors up to 30 hp., 220 volts, 60 hp., 440 volts and 75 hp., 550 volts. Starter contains an unfused or fusible safety switch and a magnetic starter with overload relays. Starter is small and narrow, having safety switch front operated and a cover that swings vertically. Safety switch has wiping wedge, double-break contacts, heavy gauge steel parts with all actuating parts case-hardened. Magnetic starters have



bushed arm bearings and larger-than-average clearances between live parts and high arc rupturing capacity. Overload relays are designed to provide sensitive overload protection and have high heat inertia to withstand heavy overloads.

Electrical Contracting, March, 1934

CUTLER HAMMER Safety Switches

Born in the Fire of Experience

Since the beginning of electric power, Cutler-Hammer has been the mark of outstanding quality in Motor Control. For almost forty years C-H engineers have met the electrical problems of Industry.

Of such experience, quite naturally, was born a superior line of Safety Switches... marked by the famous C-H insignia. A complete line of standard, weatherproof and explosion-proof switches—each built to the needs of its service—built to the needs of electrical people—built to the standard expected of Cutler-Hammer engineers. Easy to sell, easy to install, dependable and economical to use. Complete stocks are carried by responsible independent wholesalers. CUTLER-HAMMER, Inc., *Pioneer Manufacturers of Electric Control Apparatus*, 1306 St. Paul Ave., Milwaukee, Wis.



Meter Entrance Switches: Cutler-Hammer also manufactures a comprehensive line of Meter Entrance Switches to meet the varying requirements of different localities. Write for catalog.

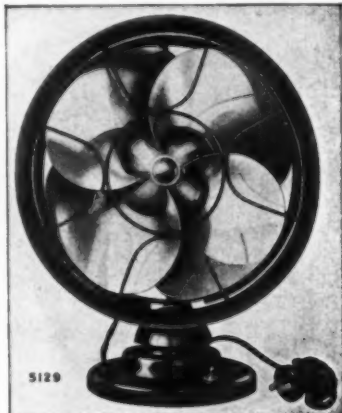
CUTLER HAMMER



March New Products

Fan

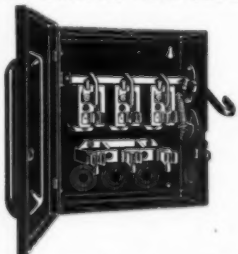
The Emerson Electric Mfg. Co., St. Louis, Mo., announces a 10 in. oscillator fan known as "The Silver Swan". One of the features of this fan is the overlapping blade design. The blades are of



sheet aluminum, mounted on an aluminum shell with stream line effect. Guard and base are of harmonizing satin finish. Fan assembly and motor shell are finished in polished natural aluminum. The fan has an Emerson 1934 induction motor and fully enclosed oscillating mechanism.

Industrial Switches

The Wadsworth Electric Mfg. Co., Covington, Ky., announces a line of cover control, quick make and break, fused and unfused industrial switches available in 2, 3, 4 and 5 poles, 230 and 575 volts. Switches have self-aligning



rectangular formed blades. Each blade seats in an individual fibre carrier and each set of switch jaws is mounted in an individual insulated recess and contact is made and broken within insulated recess. Units have small cabinets and supplied with concentric "Ring-cut" knockouts.

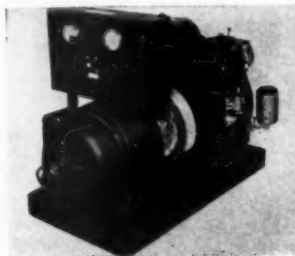
Oil Stop

Irvington Varnish and Insulator Co., Irvington, N. J., announces Harvel oil stop, which is a viscous non-drying oil. This oil is applied in the form of a liquid and then "sets" in location, even in the absence of air, to form a firm rubber-like structure which is not affected by oil or strong solutions of either acid or alkali, and is waterproof and weatherproof. Heat will not soften it

but only hastens its reaction to a rubber-like solid. Oil stop does not contain solvents and adheres to rubber, varnished cambric, oil impregnated paper and copper, and is suitable for use in all types of cable splices and cable terminals, and particularly for splicing oil impregnated paper insulated cables to rubber insulated cables.

Electric Light Plant

Kato Engineering Co., Mankato, Minn., announces a line of a.c. power and light plants, ranging from 300 to 5,000 watts a.c. and including 600 and 1,250 watt 32-volt storage battery plants. Illustration shown above is a type 12A 110-volt 60 cycle a.c. plant. All plants are



self-cracking. Generator design gives the plants good voltage regulation and changes in voltage between partial and full load is held to very close limits. Plants can also be furnished with remote control panel for starting and stopping from remote points with bell push buttons, electric choke, d.c. ammeter to show starting battery charging rate and a.c. voltmeter, all completely enclosed inside steel cabinet, mounted on top of generator.

Panels for Small Circuit Breakers

Self-supporting steel panels for mounting small oil circuit breakers for isolated installations have been announced by General Electric Co., Schenectady, N. Y. Equipment consists of an isolated flanged steel panel to which supporting feet have been welded so that panel may be fastened to the floor. In addition to breaker and its operating lever, accessory apparatus such as current transformers, relays, etc., can be mounted on panel. A metal guard can also be obtained to enclose back of equipment from top of breaker tank to the top of panel. Equipment is suitable for use on ungrounded systems up to 2500 volts. Oil circuit breaker interrupting ratings are 20,000 to 50,000 kva.

Panelette

The Switch & Panel Division, Square D Company, Detroit, Mich., has placed on the market a line of panelettes to accommodate Despard apparatus, complete from 4 to 12 single fused circuits. Panelette provides for single pole, two-pole three-way and four-way switches, convenience outlets, pilot lamps and lock switches of Despard line. Knockouts for Despard fittings are arranged in gangs of three, but may be used for one or two devices if desired. Trim is finished



in black Crystallac. Cabinets are provided with loom knockouts in back and concentric $\frac{1}{2}$ and $\frac{3}{4}$ in. loom knockouts in top, bottom and sides.

Capacitor Motors

A line of single phase explosion-proof self-contained capacitor motors adaptable for oil bulk station use as well as for use in all Class I Group D hazardous locations are announced by The Louis Allis Co., Milwaukee, Wis. Capacitor is self-contained within motor and a positive-acting switch cuts out capacitor at definite predetermined speed. Motor is available at present in the non-ventilated type from $\frac{1}{2}$ to 1 h.p. and totally-enclosed fan-cooled type from $1\frac{1}{2}$ to 3 h.p. Manufacturer states that this new motor is connectable externally for either 110 or 220 volts.

Universal Winder

E. R. Seifert, Inc., Syracuse, N. Y., announces a coil winding machine with automatic dual winding speed that starts at low speed and after a few turns accelerates to high speed, dropping down



to low again for the finishing turns. Unit has automatic counting control that allows machine to be pre-set for an automatic stop at any single revolution of the winding spindle from 1 to 100,000. Manufacturer claims that the automatic winding machine is adaptable to an extremely wide range of coil windings.

Electrical Contracting, March, 1934

PARANITE

now offers a
**Complete
Line**
of
**wire and cable
products**

During the past three years a number of items have been added to the Paranite line of wire and cable in order to make the line complete.

Now for the first time the Paranite line offers the electrical contractor every commercial type of building wire and cable and every size.

With branch sales offices in every major marketing area and stocks carried by responsible wholesalers in every wholesaling center Paranite is in a position to fill all of your wire and cable requirements promptly.

Rubber Covered Wires & Cable
Code, Intermediate and 30%
(Flame Resistant Finish)

Lead Covered Wires & Cable
Code, Intermediate and 30%

Braided Locomotive & Mining Machine
Cables

Extra Flex Motor Lead Cable

Armored Cables

Flexible Steel Conduit

Flex Lamp Cords and Portable Cords

Heater Cords

Dreadnaught Rubber Sheathed Portable
Cord

"SX" Rubber Sheathed Portable Cord

Paraduct Non-Metallic Flexible Conduit

Paraflex Non-Metallic Sheathed Cable

Friction Tape

Splicing Compound

Cord Sets

Radio Wires of all kinds

Magnet Wire

Neon Cable

PARANITE WIRE & CABLE CORP.

JONESBORO, INDIANA

Division of

ESSEX WIRE CORPORATION

DETROIT,

MICHIGAN



BURNDY QIKTAP



*Installed
in a minute
with only a
wrench*

BURNDY
ENGINEERING CO., INC.
305 EAST 45TH STREET, NEW YORK
Representatives in Principal Cities

MAILING LISTS

Pave the way to more sales with actual names and addresses of live prospects.

Get them from the original compilers of basic list information—up to date—accurate—guaranteed.

Tell us about your business. We'll help you find the prospects. No obligation for consultation service.

FREE

60 page Reference
Book and Mailing
LIST CATALOG

Gives counts and prices on 8,000 lines of business. Shows you how to get special lists by territories and line of business. Auto lists of all kinds. Shows you how to use the mails to sell your products and services. Write today.

R. L. POLK & CO.
Detroit, Mich.

Branches in Principal Cities
World's Largest City Directory Publishers
Mailing List Compilers. Business Statistics. Producers of Direct Mail Advertising.

ford, Connecticut, and by Edward R. Grier, his brother, who is chairman of the board of directors of The Arrow-Hart & Hegeman Electric Company.

Hart Manufacturing Co., Hartford, Conn., has released Bulletin No. 10-A covering remote control equipment. Bulletin contains descriptions of types F, G, D, B, A, H and E remote control switches, tank switch; type C relays; types K and M auxiliary relays; special relays; momentary contact switches and steel boxes and cabinets. Wiring and dimension diagrams, illustrations of units, typical installations and price-lists are also contained in the bulletin.

L. S. Brach Manufacturing Co., Newark, N. J., announces the appointment of Edwin C. Butler sales manager of the Fuse-O-Lite and Test-O-Lite division of the company.

Wolverine Tube Co., Detroit, Mich., announces the appointment of J. T. Hill of the J. T. Hill Sales Co., Los Angeles, to represent its line in California and the southwest. Mr. Hill was formerly with DeForest Radio.

W. H. Beaven, Birmingham, Ala., was also appointed to represent Wolverine Tube Co. in Florida, Georgia, Alabama, Tennessee, Louisiana and Mississippi.

General Cable Corporation, New York City, has just released its Magnet Wire catalog covering copper conductors of magnet wire, enameled round copper magnet wire, cotton covered copper magnet wire (round), cotton covered rectangular copper magnet wire, silk covered copper magnet wire and other types of copper magnet wire. Specifications and tables for each different type of wire are included in this catalog, as well as conversion tables, wire gauges and standard reel and spool sizes.

Classified Advertising

Opportunity—We will sell your used correspondence courses, technical books and special tools. Commission basis. You pay less when you buy and get more when you sell. Write to Thomas', 823 E. Main St., Lykens, Penn.

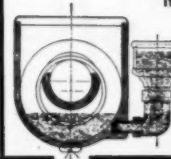
End Oiling Problems—Breakdowns



Faulty oiling causes 75% of motor troubles . . . causes most of the grief in maintenance work.

SpeedWay
Constant Level Oilers

Supply just the right amount of oil, cut oiling time, save oil. Put them on all motors. Profitable to everyone.



**Test Before
You Buy**

Write for contractors' discounts and our 30-day Free Trial Offer.

SpeedWay Mfg. Co.
1840 So. 52nd Ave., Cicero, Ill.



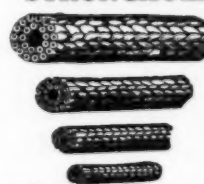
**"Standardize on
STANDARD
Transformers"**

ALL TYPES
Indoor and
Outdoor
Service

Send for
Descriptive
Bulletin

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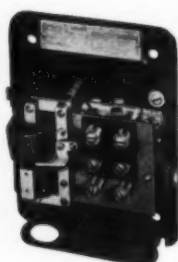
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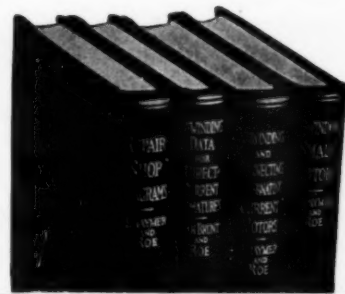
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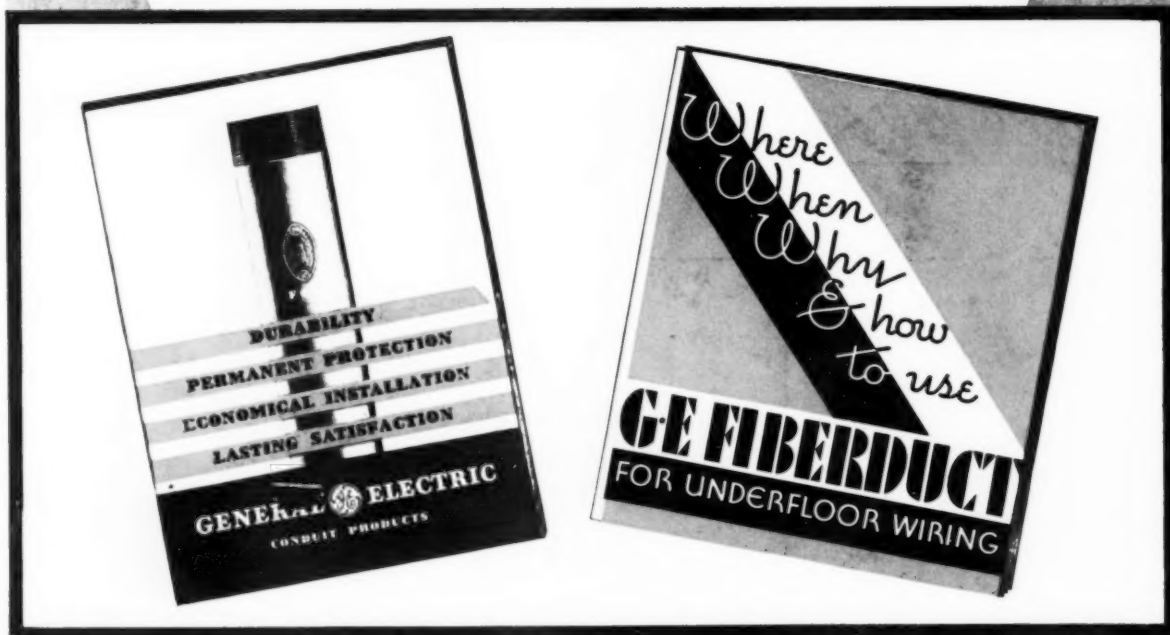
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